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In order to ascertain the present status of industrial education in California and its future, data were collected from several sources including principals, teachers, supervisors, and junior and state college personnel. The study was limited to industrial arts and trade-technical education in the state's secondary schools excluding area vocational schools and technical occupational centers. "Present Program" persents data on industrial arts enrollment, courses offered, teacher characteristics, student characteristics, and instructional practices. "Current Innovations and Related Programs and Studies" reviews several curriculum development projects in the United States. "Relationship of Industrial Arts to Vocational Trade-Technical Education" contrasts teachers and their assignments, financing, course relationships, enrollments, course content, instructional practices, and outlines the unique characteristics of both programs. "Industrial Education in California Institutions of Higher Education" discusses educational programs, certification requirements, enrollment, and the primary functions of each field. Sixty-three conclusions and recommendations are included. (EM)

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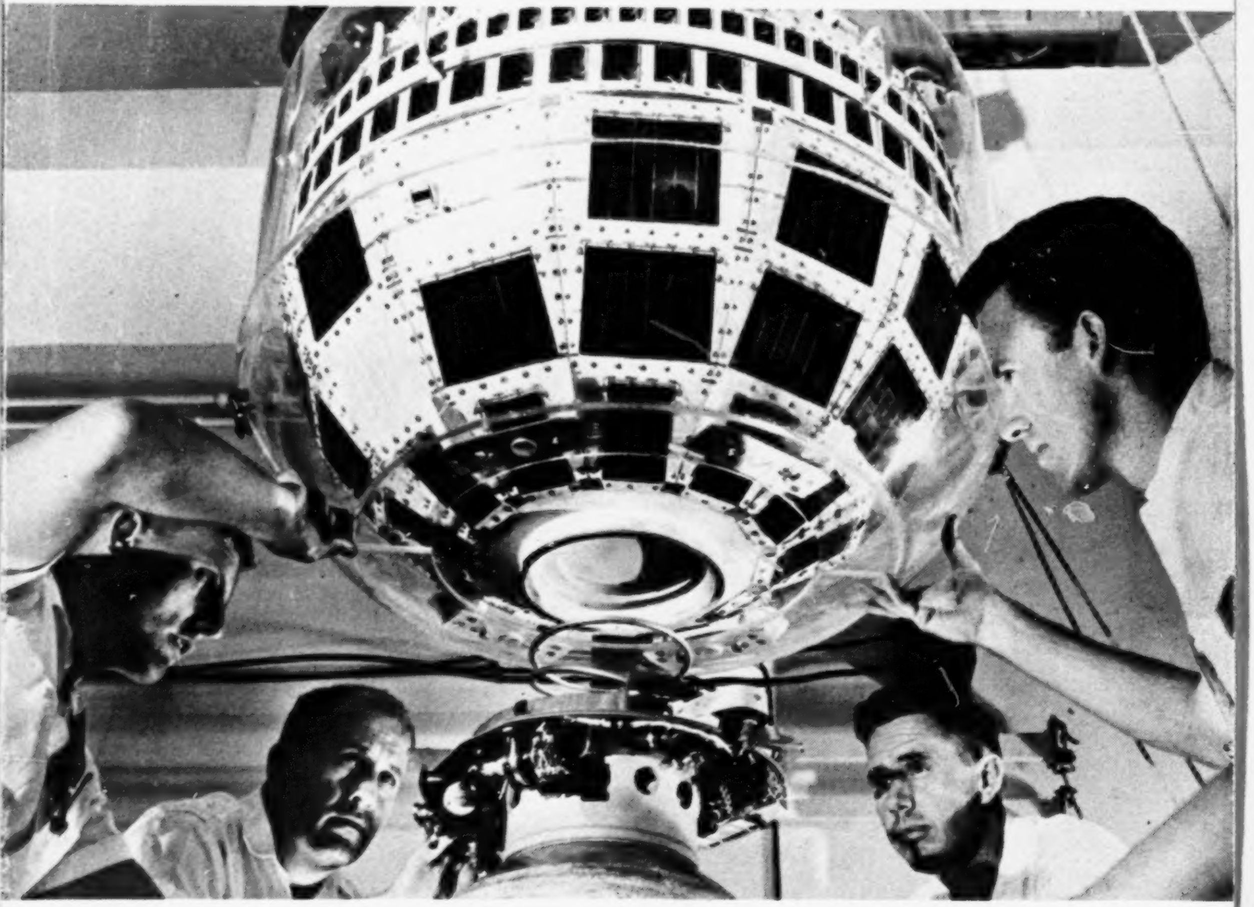
# A Study of the Relationship of Industrial Arts Education to Vocational Trade-Technical Education in California



Irvin Lathrop and Wilbur Farr

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California State College at Long Beach
in cooperation with
California State Department of Education - Bureau of Industrial Education
1968

A STUDY OF THE RELATIONSHIP OF INDUSTRIAL ARTS EDUCATION TO VOCATIONAL TRADE-TECHNICAL EDUCATION IN CALIFORNIA

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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# RELATIONSHIP OF INDUSTRIAL ARTS EDUCATION TO VOCATIONAL TRADE-TECHNICAL EDUCATION IN CALIFORNIA

## A SURVEY REPORT

3 California State College at Long Beach
in cooperation with
4 Bureau of Industrial Education
4 California State Department of Education Sacramento.

# Foreword

Industrial Education in the State of California has a long history of accomplishment. From the time of the establishment of the first programs to the present day there has been continual growth in both numbers and diversity of offerings. There is every indication that the existing programs will continue to do well the tasks for which they were developed.

However, there has never been a comprehensive study of the industrial education program in the state. This is research that is needed for further development of programs and decision making at all levels of education. This research should provide information about what is in existence and information about what leaders think should take place based on the existing programs and the expanding technology.

The study has been conducted from a statewide point of view, with concern for the overall picture of industrial education rather than for details of local operations. However, the recommendations in many cases may be more pertinent to one section of the state than to others. The recommendations reflect the best professional judgments of leaders in industrial education both in and out of the state.

This publication is intended to supply some of the answers about present programs and to serve as a discussion guide for the development of programs to strengthen this area in the years ahead.

We are grateful to the many administrators and teachers who answered questionnaires for the study. We are also grateful to the many supervisors and teacher educators who supplied data for the study. Our appreciation is also expressed to the McDonnell Douglas Corporation, Autonetics Division of North American Rockwell Corporation, Collins Radio Company and the Ohio State Industrial Arts Curriculum Project for the photographs used as chapter dividers. We hope that this study will make a substantial contribution to the improvement and upgrading of the profession in the State of California.

Richard S. Nelson
Chief, Bureau of Industrial Education
California State Department of Education

# Contents

Chapter Page

I. INTRODUCTION ........ 1
  - Purpose of the Study ........ 2
  - Sources of Data and Method of Instruction ........ 2
  - Limitations ........ 4
  - Consultants ........ 5
  - Definition of Terms ........ 5

II. PRESENT PROGRAM ........ 10
  - Elementary School Program ........ 10
  - Junior High School Program ........ 10
  - Senior High School Program ........ 11
  - Summary of the Data ........ 12
    - Statewide Enrollment and Number of Teachers ........ 14
    - Types of Programs ........ 15
    - Characteristics of Teachers ........ 17
    - Programs ........ 26
    - Students ........ 31

III. CURRENT INNOVATIONS AND RELATED PROGRAMS AND STUDIES ........ 40
  - Curriculum Development ........ 40
    - American Industry Project ........ 40
    - Cluster Study ........ 41
    - Industriology ........ 43
    - Industrial Arts Curriculum Project ........ 43
    - Vicoed ........ 44
  - Related Studies ........ 46
  - Related Programs ........ 49
  - Trends ........ 53

IV. RELATIONSHIP OF INDUSTRIAL ARTS TO VOCATIONAL TRADE-TECHNICAL EDUCATION ........ 56
  - Articulation ........ 70
  - Relationship of All Phases of Industrial Education ........ 72
  - Unique Characteristics Which Describe Trade and Industrial/Technical Education and Industrial Arts ........ 76

## Contents (Cont.)

Chapter Page

V. INDUSTRIAL EDUCATION IN CALIFORNIA INSTITUTIONS OF HIGHER EDUCATION ..... 80
  Industrial Arts Education ..... 80
  Industrial Technology ..... 80
  Bachelor of Vocational Education Degree ..... 82
  The Standard Teaching Credential with a Specialization in Secondary Teaching ..... 82
  The Standard Designated Subjects Teaching Credential (Article 8.0) ..... 83
  The Standard Designated Subjects Teaching Credential (Article 8.1) ..... 84
  State Colleges ..... 85
  Division of Vocational Education ..... 87

VI. SUMMARY, CONCLUSONS AND RECOMMENDATIONS 90
  Summary ..... 90
  Conclusions ..... 93
  Recommendations ..... 96
    Elementary School ..... 96
    Junior High School ..... 96
    Senior High School ..... 97
    Colleges and Credentials ..... 98
    General Recommendations ..... 99
    Recommendations for Further Study ..... 100

Bibliography ..... 102

Appendix ..... 103

  Out-of-State Consultants ..... 104

# Introduction

There is, in the United States, an increasing awareness of public responsibility for the economic and social well-being of all American people. This is attested to by the many laws and acts being passed and by the many programs funded by federal, state and private organizations for all segments of education with special needs.

Education may be seen as one of the greatest tools in the fight to strengthen America. Education has, in varying degrees, appeared as a luxury to various people in the world and has, to a great extent, been reserved for a selected few. However, we in this country have continually taken steps to provide educational opportunities for all people.

In California, 40 per cent of all youth between the ages of 18-35 who enter the labor force do so with a high school education or less. The need for training and upgrading in skilled and semi-skilled occupations is obvious. There is today at the high school level, in many instances, an over-emphasis on college preparatory programs. This is contradictory to the fact that a majority of high school youth cannot and will not pursue a college career leading to the professions. There is a need for strong educational programs for all students regardless of their ultimate educational objective.

The State of California has long been recognized for its leadership in all areas of education including industrial education. This leadership has resulted not only from a favorable economic position and an appreciation of the importance of human resources, but also from a pioneering spirit and a willingness to adapt programs and procedures to meet new and evolving conditions.

The public school is the foundation on which an adequate vocational program or vocational choice can and should be built. As part of this foundation, industrial arts is an important segment of the total industrial education picture, and is tantamount to a strong vocational program. Recently increased emphasis has been placed on a vocational trade-technical program called occupational preparation for industrial occupations. With the advent of Federal funds through the Vocational Education Act of 1963, more of these occupational preparation programs are being implemented at the secondary level.

As a result of the new industrial occupations programs in the high school, a new credential structure was developed that allows school districts to employ teachers from industrial arts and trade-technical occupations for these programs. Since, currently, most of the teachers of these industrial occupations courses are coming from the area of industrial arts or have had industrial arts teacher preparation, it would seem most appropriate that the aspects of teacher education programs be analyzed as to function and need. It also seems important and imperative to look at the industrial arts programs at all levels to see what its occupational implications are, since industrial arts, in many cases, is the primary experience for many youngsters before they enter the world of work. This academic area is a primary source of students for vocational programs and should be evaluated as to how it is being articulated with the world of work and with the junior and senior college programs. It is specially important at the junior high school level that the aspects of vocational guidance or occupational information be investigated.

The future should bring good education, not general education or vocational education or special education—just good education for every boy and girl.[1]

## PURPOSE OF THE STUDY

The purpose of this study was to ascertain the present status of and future of industrial arts education within the public schools of California. There were many aspects of industrial arts that were studied to help determine the true perspective of this field as it related to the total picture of vocational trade-technical education.

Some of these are:

1. The present status of industrial arts at the various levels in the schools in California.
2. The changing philosophy of industrial arts education as it relates to the teacher education programs and the influence the credentialling structure has had upon the field of industrial education.
3. The relationship of industrial arts education to the total picture of industrial education, grades seven through college.
4. The changing curricular patterns that have evolved because of the changing needs in both education and industry.
5. Recommendations for study in various aspects of the program of industrial education.

## SOURCE OF DATA AND METHOD OF INVESTIGATION

The first step in conducting this study was the formulation of an advisory committee to help establish the research design and to make recommendations from the data. This committee included the following people:

Dr. C. Thomas Dean, Dean
School of Applied Arts and Sciences
California State College at Long Beach

Dr. Floyd M. Grainge, Chairman
Department of Industrial Arts
California State College at Long Beach

Mr. James A. Herman, Assistant Chief
Bureau of Industrial Education

Dr. David Allen, Coordinator Teacher Education
Bureau of Industrial Education

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[1] Kenneth Dawson, "On Technology," Symposium (San Francisco: San Francisco State College, 1965), Section IV.

Dr. Robert L. Woodward, Consultant in Industrial Arts
California State Department of Education

Dr. William A. Mays, Professor Industrial Arts
Department of Industrial Arts
California State College at Los Angeles

Mr. J. Lyman Goldsmith, Supervisor
Vocational and Practical Arts Section
Division of Instructional Service
Los Angeles City Schools

Mr. Lee Ralston, Director
Practical Arts for Los Angeles County

Data for this study were gathered from several sources. These sources included principals, teachers, supervisors, junior college personnel and state college personnel.

The number of industrial arts teachers in each school was obtained from the "California School Directory," published by the California Association of Secondary School Administrators.

A twenty-item questionnaire was prepared for each administrator in the schools listing an industrial arts department. A twenty-six-item questionnaire was prepared for each teacher of industrial arts in these same schools. An envelope was addressed to the principal using address labels supplied by the Bureau of Industrial Education.

One principal questionnaire and enough teacher questionnaires for each industrial arts teacher in the school were sent to the principal with instructions to distribute one teacher questionnaire to each of his teachers. A return envelope was supplied with each questionnaire. In some districts where there was an industrial education supervisor the questionnaires were distributed by this individual.

Information concerning the present programs, teachers, teaching methods, curriculum and plans for future programs were obtained from the respondents. Because it was considered desirable to have respondents feel free to make any comments they so desired, the respondents were not identified in any way on the returned questionnaire. For this reason, there was no attempt at a follow-up questionnaire for those who did not respond to the first one.

Responses were received from all sections of the state. All the large districts in the state were represented by the returns. There were 60 per cent useable returns from the principals. There were 51 per cent useable returns from the teachers. The information was coded and placed on IBM cards for processing by electronic data processing equipment. The facilities of the Bureau of Institutional Research at California State College at Long Beach were utilized for this processing.

Inasmuch as one of the problems posed in the study was that of articulation between the high schools and community college programs and between community college programs and state college programs, a short, six-item questionnaire was prepared covering this topic. This questionnaire was sent to the Coordinator of Technical Education or to the Dean of Instruction at 73 community colleges. There were useable responses from 78 per cent of the community colleges.

For several years the majority of the teachers teaching industrial arts and occupational classes in the public schools have come from the California State Colleges. Because of a recent problem of supply and demand and changes in the credentialling laws of the State of California, it was thought necessary to determine in what direction the state colleges were going with respect to teacher education.

To obtain this information, a short questionnaire was prepared and sent to the department chairman of each of the state college industrial arts departments. In addition, a follow-up visit was made to collect the questionnaire, and to answer any questions that the chairman or faculty members may have had. In addition to this, a college catalog was requested from each of the colleges.

Industrial arts supervisors represent "on-line" administration of industrial arts and vocational education programs. It was deemed desirable to have information and the thinking of supervisors concerning the various segments of the total picture of industrial education. To collect information from the supervisors, several taped interviews were held with supervisors in various sections of the state. These supervisors included both city and county supervisors.

To be able to place all the information from the various segments of the state in context, it was necessary to know what was taking place nationwide in the field of industrial education. To accomplish this, an extensive library review of the literature concerning studies and programs in other states was undertaken.

Finally, in order to obtain as wide a divergence of thinking as possible on the problem, meetings were scheduled with leaders in industrial education from other states. These meetings were scheduled after the data had been analyzed and specific recommendations were presented. The final report contains factual data about the status of the programs in California at the present time as well as recommendations by supervisors, administrators, and leaders in the field.

## LIMITATIONS

Because of the many types of programs in industrial education and the differences in objectives and philosophies, it was necessary to impose certain limitations on this study. The study was limited to a status study of industrial arts education and vocational trade-technical education in the State of California. It was further limited to a study of the secondary schools with the exception of problems associated with articulation at other levels and of teacher preparation. This study was not concerned with the community college trade and technical programs nor with the area vocational school, or technical-occupational centers.

In addition this was an extremely difficult study to conduct in the State of California for several reasons, some of which were:

1. Sheer size of the state and numbers and purposes of the programs and teachers.

2. Differences of geography, industry, social status, and economy of the various communities.

3. Differences in types of school patterns, such as the K-8, intermediate schools, and three and four-year high schools.

4. The multitude and diversity of the programs that have appeared in the last five years.

5. There have been and still are wide differences of opinion as to the definition, role, and functions of industrial arts, vocational education and vocational-trade and technical education.

## CONSULTANTS

One phase of the study involved obtaining opinions and recommendations from leaders in industrial arts and vocational education outside the State of California. In addition, programs and shops were visited and information obtained from out of state about new projects which might have implications for California.

The majority of the individuals consulted and programs visited were in the western part of the country because it was believed they might have problems more nearly resembling those of California. However, individuals were interviewed and some programs were visited in other sections of the United States.

A listing of the out-of-state consultants, supervisors, administrators, teachers and teacher educators is included in the appendix.

In California many people contributed to the study. Representatives of industrial arts departments at all the California State Colleges were interviewed. Interviews were conducted with over twenty city and county supervisors of industrial education. Over two thousand teachers and seven hundred administrators contributed to the study by answering the questionnaires. Supervisors, teachers and teacher educators from all sections of the state contributed data for his study; however, no listing of individuals is included as it would make the report unnecessarily long.

## DEFINITIONS OF TERMS

Because different interpretations are placed on terms associated with the fields on industrial arts education and vocational trade-technical education, it was deemed advisable to define certain of the terms used in this study. For purposes of this study the following definitions will be used:

**Comprehensive High School**

A secondary school with a number of departments (e.g., academic, industrial, business) offering a diversified program to meet the needs of pupils with varying interests and abilities.[2]

**Credentials**

The Standard Teaching Credential with a specialization in secondary teaching authorizes one to teach in grades 7 through 12, inclusive, any course in which the holder has completed a subject matter major or minor.

The Standard Designated Subjects Teaching Credential—Specialization in Vocational Trade and Technical Teaching (Article 8.0) authorizes one to teach in grades 9 through 14 and in classes for adults (including, but not being limited to, courses reimbursed from vocational education funds) the general and specific subject or subjects named on the credential.

The Standard Designated Subjects Teaching Credential—Industrial Arts and Occupational Subjects (Article 8.1) authorizes one to teach the subject or subjects listed on the credential in both industrial arts and occupational classes in grades 9 through 12 including, but not limited to, courses reimbursed from vocational funds.

**Elementary School Industrial Arts**

That phase of the elementary school curriculum which provides the child with opportunities for exploration, manipulation, experimentation, and planning the use of tools, materials, and techniques appropriate to converting materials to serve useful purposes. Planned activities and experiences include (1) the construction of projects related to and reinforcing the elementary school subject matter, and projects related to recreational and personal purposes; and (2) a study of industry with emphasis on its organization, materials, processes, occupations, products, and problems, and their effect on man's past and present cultures.[3]

**Exceptional Programs**

Programs for students at both extremes of ability range. These include programs for superior students and programs for the slow learners.

**General Industrial Arts** (Multiple Activity Shop-
Comprehensive General Shop)

The study of two or more separate and somewhat distinct aspects of industry and technology. Learning experiences involve activities such as experimenting, designing, constructing, evaluating, and using a variety of tools, materials, and processes.[4]

**Industrial Arts**

Industrial Arts is the body of related subject matter, or related courses, organized for the development of understanding about the technical, consumer, occupational, recreational, organizational, social, historical, and cultured aspects of industry and technology. Learning experiences involve activities such as experimenting, designing, constructing, evaluating, and using tools, materials, and processes which provide opportunities for creativity and problem solving.[5]

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[2] "Standard Terminology for Instruction in Local and State School Systems" (Washington: U.S. Department of Health, Education and Welfare, May 1967).

[3] Ibid. [4] Ibid. [5] Ibid.

**Junior High School**

A separately organized and administered secondary school intermediate between the elementary and senior high schools, usually including grades 7, 8, and 9 or grades 7 and 8.[6]

**Middle School**

A separately organized and administered school usually beginning with grades 5 or 6 or its equivalent and including at least three grades or years.[7]

**National Defense Education Act of 1958** (Public Law 85-864)
**As Amended**

Title III of this law was enacted to authorize matching federal funds to strengthen instruction in critical subjects such as industrial arts by means of equipment and instructional material or minor remodeling to any public school district, county superintendent's office, or public agency controlling an elementary or secondary school.[8]

**Occupational Program**

A secondary school, junior college, or adult education program of studies designed primarily to prepare pupils for immediate employment or upgrading in an occupation or cluster of occupations.[9]

**Occupational Preparation (Industrial Occupations Program—High School**

A vocational trade-technical program designed to provide opportunities for high school students to receive an occupationally oriented program which has as its primary goals the development of skills and understandings to the degree of competency to enable a student to enter and hold a job in the occupational area of his interest and choice or to enter into and be better prepared to continue his education in a trade and technical program at the community college level. The program is organized around industrial problems that are encountered by the entry level employee. Emphasis is directed to the development of the student's skills and competencies necessary to solve problems and be of value to the employer.

**Prevocational Education**

Orientation to a number of different occupational areas and counseling designed to assist a person in determining the occupational area(s) in which he might best be trained.[10]

**Secondary School**

A school comprising any span of grades beginning with the next grade following an elementary or middle school and ending with or below grade 12.[11]

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[6] Ibid. [7] Ibid.
[8] "National Defense Education Act—Title III," Manual of Information and Instructions (Sacramento: California State Department of Education, 1966).
[9] "Standard Terminology, op-cit."
[10] Ibid. [11] Ibid.

### Senior High School

A secondary school offering the final years of high school work necessary for graduation and invariably preceded by a junior high school.[12]

### Vocational Education Act of 1963 (Public Law 88-210)

This law was enacted "to authorize federal grants to states to assist them to maintain, extend, and improve existing programs of vocational education, to develop new programs of vocational education, and to provide part-time employment for youths who need the earnings from such employment to continue their vocational training on a full-time basis, so that persons of all ages in all communities of the state—those in high school, those who have completed or discontinued their formal education and are preparing to enter the labor market, those who have already entered the labor market but need to upgrade their skills or learn new ones, and those with special educational handicaps—will have ready access to vocational training or retraining which is of high quality, which is realistic in the light of actual or anticipated opportunities for gainful employment, and which is suited to their needs, interests, and ability to benefit from such training."[13]

### Vocational Trade - Technical Education

Vocational trade-technical education refers to those educational experiences specifically designed to equip students for successful, gainful employment in industrial occupations. These occupations include the traditional trades as well as service and technical occupational classifications in industry. Vocational trade-technical education is offered in the upper grades of senior high schools, in adult schools and in colleges. Vocational trade-technical education includes pre-employment and extension training.

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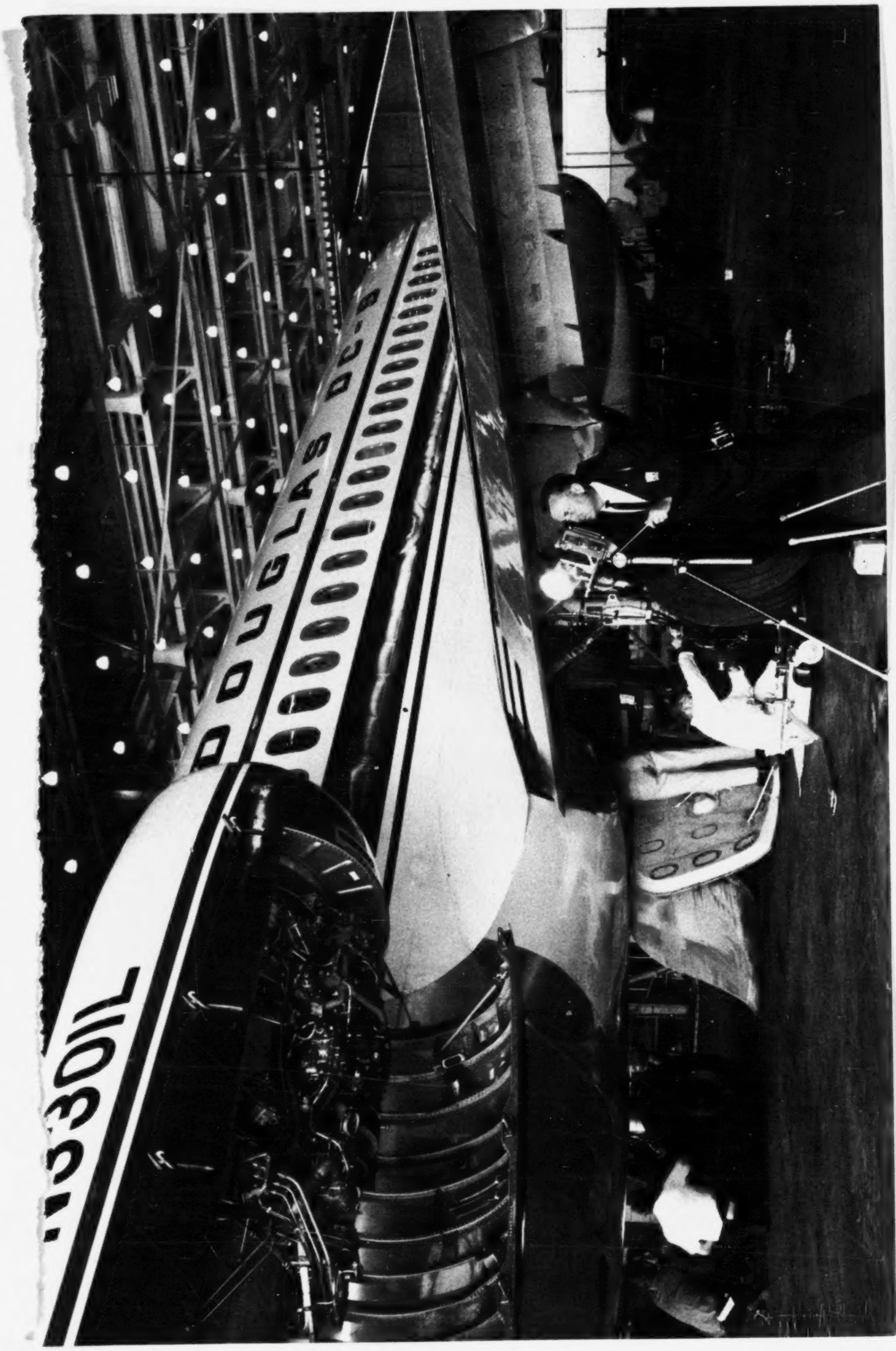
[12] Ibid.

[13] "Definition of Terms Used in Industrial Education" (Sacramento: Bureau of Industrial Education, 1967).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## CHAPTER II

# Present Program

Industrial education is an integral part of the educational program in the public schools of California. The increasing complexty of our modern technological society encountered in almost every phase of daily living make industrial education experiences essential for all youth.

Industrial education in California is an important part of the total program of education that has as its major purposes the preparation of youth and adults for participation in (1) our industrial society; and (2) occupations and professions.

Industrial education derives its content from the tools, instruments, machines, materials, processes, power, occupations, and know-how that makes industry function. It is a generic term applying to all types of education related to industry, including industrial arts education and vocational trade-technical education.

## ELEMENTARY SCHOOL PROGRAM

Industrial arts in the elementary schools (kindergarten through grade 6) is designed to further educational objectives and to enrich the experiences pupils have in attaining them. Industrial arts at this level involves material things; it is concrete and it is active; it includes making things, doing things, and using things. These instructional activities, coupled with experiences of related nature, lend themselves to acquainting young people with the industrial world in which they live.

The regular classroom teacher has the responsibility for conducting the elementary school industrial arts program and pupils particpate in experiences relating to language arts, mathematics, science, and social studies. Examples of specific activities are: (1) constructing a model airport as part of a unit on transportation; (2) experimenting with the strength of materials; (3) visiting a building site as a part of a unit on shelter or housing; (4) exploring a wooded area as part of a unit on nature's materials; (5) collecting and mounting samples of printing as part of a unit on communicative arts; (6) observing an industrial assembly unit as part of a unit on manufacturing.[1]

## JUNIOR HIGH SCHOOL PROGRAM

Industrial arts is an integral and often required part of the total program of education for all youth at the junior high school level. Students at this grade level are usually guided through a series of exploratory experiences in a variety of industrial arts areas. Included in a recommended program are drafting, electricity-electronics, graphic arts, industrial crafts, metals, power mechanics, and woods.

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[1] John L. Feirer and John R. Lindbeck, "Industrial Arts Education" (New York: The Center for Applied Research in Education, Inc., 1966), pp. 20-28.

In a large school each of these areas may be taught in a separate shop. These facilities are called limited general shops, as they provide facilities for experiences in a number of closely allied instructional activities in a single industrial arts area. For example, a metalworking course includes art metal, casting, finishing, forging, heat treating, metal machining, sheetmetal, and welding. Industrial arts may be taught in a comprehensive general shop in schools with a small enrollment. A comprehensive general shop includes activities in two or more areas such as drafting, electricity-electronics, metalworking, and woodworking. In large schools where several shops are available, opportunities should be provided for students to spend from a half semester to a full semester in each shop. In the small schools, where a comprehensive general shop is used, a student should be given a variety of experiences in several areas.

Special emphasis is given to grades 7, 8 and 9 to help students discover and develop their aptitudes, abilities, and interests. Provision is made for the development of a variety of skills and for opportunities for creative activities. An understanding of the industrial-technological world and its effects upon our society is developed. Activities involving the practical application of mathematics, science, language arts, and social studies are inherent in industrial arts.[2]

## SENIOR HIGH SCHOOL PROGRAM

Students at the senior high school level may elect industrial arts as a major subject to be followed during their entire high school program. These students may have completed the basic industrial arts courses offered at the junior high school level. If they have not had this opportunity, the high school program provides for these basic courses. High school industrial arts courses include the following areas: (1) automotives; (2) drafting; (3) electricity/electronics; (4) graphic arts; (5) industrial crafts; (6) metals; (7) photography; (8) plastics; (9) power mechanics, and (10) woods. It is recommended that students have experience in each of the industrial arts areas available in the school before they are encouraged to select an area for concentration.

The well-rounded high school industrial arts curriculum includes opportunities in areas not provided at the junior high school level, plus opportunities for advanced experiences in areas previously studied. The curriculum provides opportunities for students to have comprehensive and enriching experiences that will enable them to acquire basic knowledge, understandings, and skills in the fundamental principles, techniques, procedures, and processes used in industry.

A detailed study of one or more local or national industries gives students insights into research and experimentation; mass production principles; quality control, organization, automation, increased production and etc. of our industrial society.

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[2] "Industrial Arts Education (Washington, D.C.: American Industrial Arts Association, 1963), p. 7.

The advanced techniques developed in high school courses should approach the procedures used in industry. At this level emphasis is given to occupational practices and information relating to a specific industrial arts area. In this way advanced industrial arts work is effective occupational guidance, and for some students it provides opportunity for more advanced experiences within a chosen occupational area.

The high school student, regardless of his major, should have the opportunity to elect industrial arts courses. The elective courses provide equal and challenging opportunities for scientifically or mathematically oriented students to work and experiment with new materials, processes, ideas, and designs.[3]

With the advent of the Vocational Education Act of 1963, funds became available for expanding vocational trade-technical education. With the available funds the means for broadening the offerings of the comprehensive high school became possible.

The Industrial Occupations Program was designed to provide opportunities for high school students to receive an occupationally oriented program which has as its primary goal the development of skills and understanding to the degree of competency wherein the student can enter into and hold a job in the occupational area of his interest and choice—or to enter into and be better perpared to continue his education in a trade and technical program at the community college.

Specific objectives of this program are to enable youth to develop entry-level job skills, develop habits and attitudes which contribute to success on the job, and permit youth to transfer to a trade-technical program at a community college.

The industrial occupations instructional program for this study is limited to those offered in the comprehensive senior high school including both reimbursed and non-reimbursed programs. Ordinarily these programs are offered in two-hour blocks in the eleventh and twelfth grades.

The areas commonly included in the high school industrial occupations program include the general areas of automotive, drafting, electronics, graphic arts, metals, photography, and woods.

## SUMMARY OF THE DATA

In order to make meaningful recommendations about any program, it is necessary to have as much objective information as possible on which to base these recommendations. The information in this chapter is mainly a summary of the data derived from a 20-item questionnaire sent to school administrators and a 26-item questionnaire sent to teachers. This chapter presents the data obtained from these questionnaires as well as some data obtained from taped interviews with selected city and county supervisors.

There were a total of 710 replies from school administrators. Unfortunately not all replies were useable for every question, so there may be differences in totals from table to table. The location of the administrative respondents is shown on Table 1.

---

[3] Ibid. p. 8.

## Table 1

## LOCATION OF RESPONSES TO ADMINISTRATIVE QUESTIONNAIRE

| Location | Number | % |
|---|---|---|
| Los Angeles | 63 | 9.0 |
| Fresno | 16 | 2.3 |
| San Jose | 12 | 1.7 |
| Oakland | 8 | 1.1 |
| San Francisco | 18 | 2.6 |
| Long Beach | 8 | 1.1 |
| Other | 508 | 72.8 |
| Orange County | 58 | 8.3 |
| No Location | 7 | 1.1 |
| Total | 698 | 100.0 |

Table 1 reveals that fewer than 25 per cent of the responses came from large metropolitan areas. The other 75 per cent represented all other areas of the state, from small rural schools of the K-12 type through medium-sized unified districts. It was believed that the responses were representative of the schools in California.

The size of 702 schools of the respondents is shown in Table 2. The smallest school reported had fewer than 100 enrollment. There were 49 schools who reported enrollments over 2500. The median enrollment in the schools of the respondents is in the 1000-1500 category. This parallels the findings of Marshall Schmitt in his nationwide study of industrial arts where he found that enrollment in industrial arts is concentrated in the schools with enrollment size over 1000.

## Table 2

## SIZE OF SCHOOLS INCLUDED IN THE STUDY

| Enrollment | Number | % |
|---|---|---|
| 1-299 | 34 | 4.8 |
| 300-499 | 38 | 5.4 |
| 500-749 | 69 | 9.8 |
| 750-999 | 77 | 11.0 |
| 1000-1499 | 172 | 24.5 |
| 1500-1999 | 137 | 19.5 |
| 2000-2499 | 80 | 11.4 |
| 2500 and Over | 46 | 6.6 |
| No Answer | 49 | 7.0 |
| Total | 702 | 100.0 |

The organization pattern of the respondent schools is shown in Figure 1. It is interesting to note that there were more four-year high schools than three-year high schools.

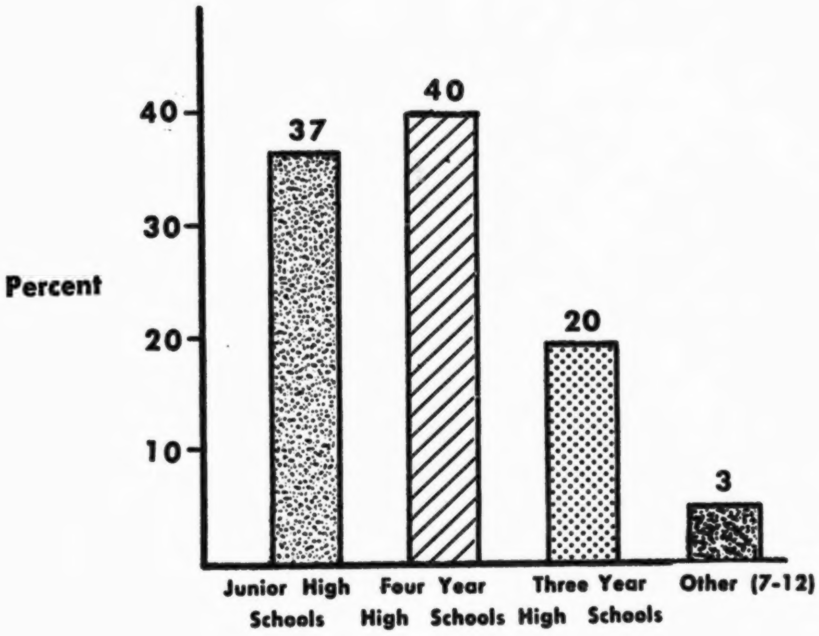


Figure 1

GRADE LEVELS OF SCHOOLS IN THE STUDY

If the responses are considered as representative of the type of organizational pattern in the state then there are considerably more four-year high schools than three-year high schools. From the responses it was determined that the three-year high school is predominantly a large-city type of organization associated with large unified school districts.

The junior high school classification includes organizational patterns such as, 6 7 8, 7 8 9, 7 8, and 8 9. However, the predominant type of junior high school organization included in the study includes grades 7 8 and 9. Not included in the study are the K-8 schools and some of the intermediate 7-8 schools. However, it was assumed that the schools represented by the responses to the questionnaire are representative of the type of schools in the state.

With the emergence of the middle school concept there may, in the near future, be a change in the school organizational pattern in California. In some parts of the country this concept is gaining considerable strength and there is every reason to believe at least some of the California schools will adopt this organizational pattern.

### Statewide Enrollment and Number of Teachers

Robert L. Woodward, Consultant in Industrial Arts, provided figures on past, present and projected enrollments and number of industrial art teachers.

The total enrollments of students in grades 7 through 12 for years 1962-66 are shown in Table 3. This indicates approximate increases in enrollments of 62,000 or 4 per cent each year.

### Table 3

### TOTAL STUDENT ENROLLMENTS, GRADES 7 THROUGH 12

| Year | Total Student Enrollment |
|---|---|
| 1962 | 1,478,238 |
| 1963 | 1,578,804 |
| 1964 | 1,657,141 |
| 1965 | 1,729,470 |

Industrial arts enrollments (and projections) of male students, grades 7-12, are indicated in Table 4.

### Table 4

### INDUSTRIAL ARTS ENROLLMENTS (AND PROJECTIONS), GRADES 7 THROUGH 12

| School Year | Number of Students |
|---|---|
| 1965-1966 | 560,000 |
| 1966-1967 | 570,000 |
| 1967-1968 | 580,000 |
| 1968-1969 | 590,000 |
| 1969-1970 | 600,000 |

As can be seen from Table 4 there is about a 10,000-student increase in enrollment each year from 1965-66. This figure is based on the fact that 66.8 per cent of the boys enrolled in school grades 7-12 enroll in industrial arts.

As indicated in Table 5 there were approximately 5,700 industrial arts teachers in California in 1967. The number of industrial arts teachers in California is based on the enrollment figures: average of 100 students per teacher (large and small schools, large and small industrial arts class enrollments, and full and part-time teachers).

### Table 5

### NUMBER OF INDUSTRIAL ARTS TEACHERS IN CALIFORNIA

| Year | Number of Teachers |
|---|---|
| 1962 | 5,000 |
| 1963 | 5,300 |
| 1964 | 5,400 |
| 1965 | 5,500 |
| 1966 | 5,600 |
| 1967 | 5,700 |

### Types of Programs in the Schools

The areas of industrial arts and the frequency of offering are shown in Table 6. It is obvious that the traditional areas of woods, drafting and metals are offered more frequently than are the other areas. Concentration of subject content in California seems to parallel the Schmitt study which indicated that the areas of woods, metals, and drafting are offered most frequently. In a geographic area where so many people depend on the automobile and the airplane for transportation, it would seem that courses in automotive and/or power mechanics should be included in the school program for all students. Almost one-half of the junior high schools offer a form of the general shop type program. The most common type is the rotating program in which the student will spend ten weeks in each of four areas such as drafting, electronics, metals, and woods. Both plastic technology and photography are assuming a more important role in the industrial picture of the country. It is, no doubt, safe to assume that new programs in the area of photography and plastics will be instituted when facilities, teachers and funds become available.

### Table 6

### INDUSTRIAL ARTS AREAS OFFERED IN THE JUNIOR AND SENIOR HIGH SCHOOLS*

| Area | Junior High<br>No. | Junior High<br>% | Senior High<br>No. | Senior High<br>% |
|---|---|---|---|---|
| Drafting | 238 | 84.3 | 404 | 97.1 |
| Woods | 258 | 91.4 | 398 | 95.6 |
| Metals | 232 | 82.2 | 359 | 86.2 |
| Automotive | 2 | .7 | 330 | 79.3 |
| Electronics | 155 | 37.2 | 315 | 75.7 |
| Graphic Arts | 92 | 22.1 | 154 | 37.0 |
| Industrial Crafts | 206 | 73.0 | 95 | 22.8 |
| Power Mechanics | 15 | 5.3 | 97 | 23.3 |
| General Shop | 133 | 47.1 | 63 | 15.1 |
| Photography | 0 | 0.0 | 20 | 4.8 |
| Plastic Technology | 0 | 0.0 | 8 | 1.9 |

*Total Reports, 416 High Schools and 828 Junior Highs

The areas and frequency of offerings in the industrial occupations program are shown in Table 7. The most frequently reported course offering was in the area of automotives. Other offerings were about evenly divided among metal, electronics, drafting, graphic arts and the combined areas of wood and construction.

### Table 7

### AREAS AND FREQUENCY OF OFFERINGS IN THE INDUSTRIAL OCCUPATIONS PROGRAM

| Area | Number | % |
|---|---|---|
| Automotives | 100 | 27.3 |
| Metals | 54 | 14.8 |
| Electronics | 51 | 13.9 |
| Drafting | 48 | 13.1 |
| Graphic Arts | 46 | 12.6 |
| Woods | 40 | 10.9 |
| Construction | 22 | 6.0 |
| Service Station | 5 | 1.4 |
| Total | 366 | 100.0 |

Table 8 shows the number of teachers in each area that are either working toward completion of the 8.1 credential or hold the clear credential as reported by Allen and Meyer.[4] A comparison of Tables 7 and 8 indicates the number of people actually conducting industrial occupations classes is approximately the same as those who are obtaining the 8.1 credential. Again the area with the greatest frequency is automotives, followed by wood, metal, drafting, electronics and graphic arts, in that order.

### Table 8

### NUMBER OF TEACHERS WITH OR COMPLETING THE REQUIREMENTS FOR THE STANDARD DESIGNATED 8.1 CREDENTIAL

| Area | Number | % |
|---|---|---|
| Auto | 102 | 22.9 |
| Wood | 84 | 18.8 |
| Metal | 83 | 18.7 |
| Drafting | 73 | 16.4 |
| Electronics | 63 | 14.2 |
| Graphic Arts | 40 | 9.0 |
| Total | 445 | 100.0 |

## Characteristics of Teachers

The teacher is the single most important aspect of any industrial arts or occupational program. Without a teacher who is competent in subject matter and who can teach this subject, there would never be anything but a mediocre program.

There are, of course, many ways to measure teacher competence; however, none of these is entirely successful. One method is to rate the academic degrees held by the teacher and the number of years of teaching experience. The supposition is that the person holding the highest degree is interested in improving himself professionally. However, this may not be entirely true at the present time, as most of the current salary schedules are tied to college credits. Thus, the individual may be more interested in attaining a higher position on the salary schedule than in improving himself professionally. In general, for want of better criteria, both degrees held and length of service are used as a measure of teaching success.

By the same token, the person who has several years of teaching experience is considered to have more competence than the beginning teacher. Thus, length of service is used as a measure of teaching success.

The highest degree held by the 2167 teacher respondents is shown in Table 9. By far the greatest percentage of teachers hold a minimum of a bachelor's degree. It is of some significance to note that over one-third of the teachers hold a master's degree. By the same token, it should be pointed out that almost 4 per cent of the teachers teaching industrial arts and/or industrial occupations classes have less than a bachelor's degree.

---

[4] David Allen and John M. Meyer, "The 8.1 Credential" (Sacramento: Bureau of Industrial Education, 1967), pp. 14-22.

### Table 9

### HIGHEST DEGREE EARNED BY RESPONDENTS

| Degree | Number | % |
|---|---|---|
| No Degree | 62 | 2.9 |
| A.A. Degree | 20 | .9 |
| B.A. | 929 | 42.9 |
| B.S. | 269 | 12.4 |
| B.V.E. | 23 | 1.1 |
| M.A. | 704 | 32.5 |
| M.S. | 154 | 7.0 |
| ED.D. | 4 | .2 |
| Other | 2 | .1 |
| Total | 2167 | 100.0 |

Figure 2 shows the number of respondents working toward a degree. It should be pointed out that over one-third of the respondents are currently working toward a degree. Probably the teachers who indicate that they now hold less than a bachelor's degree are among this one-third, since in most cases this is a condition for renewal of their teaching credential.

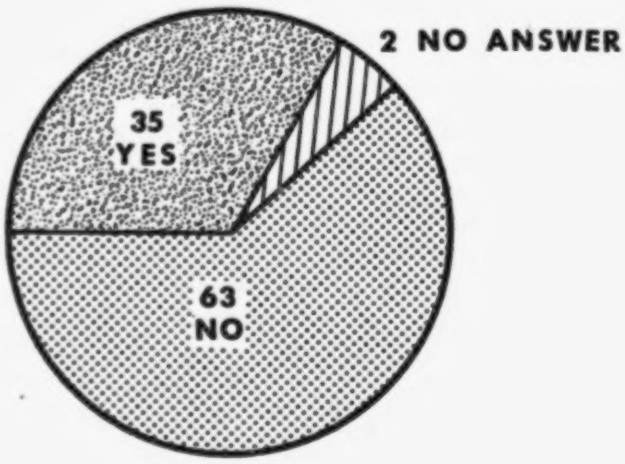


**Figure 2**

**PERCENT OF RESPONDENTS WORKING TOWARD DEGREE**

A number of years of teaching experience is shown in Table 10. The range of experience, as expected, is from 0 years, or just beginning, to over 21 years, with the greatest number of respondents indicating between 6 and 10 years of experience. By far the greatest number of industrial education teachers have over three years of experience and probably have tenure.

This would indicate that as a group industrial education teachers were fairly stable as to type of employment. However, it should be pointed out that there is no data reported to indicate how many times a person may have changed employment within the field of industrial education.

## Table 10

## NUMBER OF YEARS OF TEACHING EXPERIENCE

| Years | Number | % |
|---|---|---|
| 0-1 | 130 | 6.0 |
| 2-3 | 272 | 12.6 |
| 4-5 | 248 | 11.4 |
| 6-10 | 600 | 27.7 |
| 11-15 | 357 | 16.5 |
| 16-20 | 253 | 11.7 |
| 21 or over | 206 | 9.5 |
| No response | 100 | 4.6 |
| Total | 2167 | 100.00 |

To teach in a public school in California an individual must possess some type of a valid California Teaching Credential. There are several types of credentials available depending to some extent upon the avenue taken to obtain the credential.

Table 11 shows the types of credentials possessed by the respondents. The percentages for each credential will not add up to 100 per cent, as the categories are not mutually exclusive and a teacher may hold several credentials at the same time.

## Table 11

## TYPE OF CREDENTIAL HELD

| Type | Number | % |
|---|---|---|
| Special | 1251 | 57.7 |
| General Secondary | 1370 | 63.2 |
| Junior High | 251 | 11.6 |
| Standard Secondary | 90 | 4.2 |
| Partial Fulfillment Standard Secondary | 91 | 4.2 |
| Class A Vocational | 115 | 5.3 |
| Class B Vocational | 14 | .6 |
| Class D Vocational | 18 | .8 |
| Standard Designated 8.0 | 83 | 3.8 |
| Standard Deisgnated 8.1 | 225 | 10.3 |
| Pupil Personnel | 59 | 2.7 |
| Administrative | 157 | 7.2 |
| Supervisory Credential | 59 | 2.7 |

One measure of professional growth commonly used in the teaching profession is attainment of a valid credential. Table 12 indicated the number and percentage of respondents currently working toward credentials. By far the greatest number, 78.6 per cent, are not working toward any credential. This would indicate that these people already possess a valid teaching credential. Of those who are working toward a credential, 10 per cent are working toward the Standard Secondary Credential. The next largest group are working toward the 8.1 Credential which would qualify them to teach the reimbursed industrial occupations classes at the high school level.

It is encouraging to note that there are substantial numbers of teachers working toward the Pupil Personnel Credential. In the years to come as more emphasis is placed on technology and occupational orientation there will be a need for additional qualified people with a background of industrial knowledge qualified for counseling. More emphasis should be placed on having industrial education teachers work for the Pupil Personnel Credential.

### Table 12

### NUMBER OF RESPONDENTS INDICATING THEY WERE CURRENTLY WORKING TOWARD A CREDENTIAL

| Type | Number | % |
|---|---|---|
| Junior High | 2 | .1 |
| Standard Secondary | 218 | 10.0 |
| Standard 8.0 | 15 | .7 |
| Standard 8.1 | 112 | 5.2 |
| Pupil Personnel | 58 | 2.7 |
| Administration | 37 | 1.7 |
| Supervisory | 23 | 1.1 |
| Not Working Toward Credential | 1702 | 78.5 |
| Total | 2167 | 100.0 |

Keeping abreast of one's profession is nothing unique. Doctors, physicists and engineers have problems which are similar to teachers in keeping up to date in their respective disciplines. Taking college courses, working toward degrees and/or credentials and working in industry are all ways to keep current in one's field. However, in many cases the opportunity is not provided for these types of activities.

In response to questions about what teachers believed they needed information and help with, the areas of new developments and procedures and instructional media lead the list. Figure 3 lists the areas of greatest interest for upgrading courses.

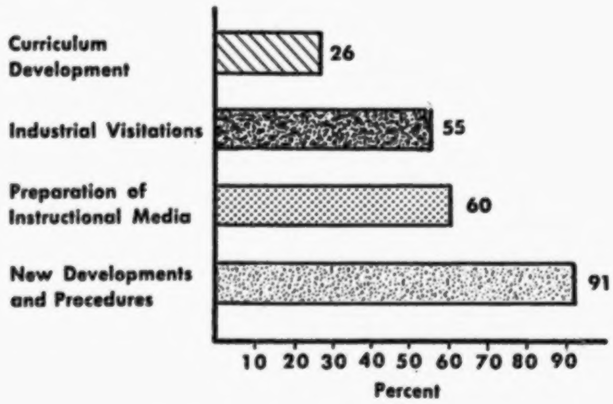


Figure 3
AREAS OF INTEREST IN PROFESSIONAL UPGRADING COURSES

From the responses to the questionnaire it would appear that some of the state colleges should give thought to special seminars or workshops in the areas of instructional media and new industrial processes and procedures. It is possible that in these areas, seminars could be offered at various points in the state during the summer months. Slightly over 80 per cent of the respondents indicated that they wished to receive college credit for in-service education. Many responderts indicated a desire for the establishment of an internship program in industry which would afford them an opportunity to secure work experience for technical upgrading and to enable them to meet requirements for the standard designated subjects credential 8.1.

From the responses it is clear that the teachers are not interested in developing curriculum. However, it should be pointed out that because the teachers are not interested in curriculum development in no way indicates it is not important or needed.

Teachers many times are called upon to teach courses outside their major area of preparation. Industrial education teachers are no exception. Table 13 shows the classes outside of industrial education that the teachers are teaching. Note that many of the teachers list other administrative duties rather than teaching. These duties include such things as department chairman or counseling. The class taught most often outside of industrial education is mathematics. Virtually all areas of education were listed as being taught by industrial education teachers. It is encouraging to notice that over 75 per cent of the teachers are teaching only industrial education classes as compared to 66 per cent reported nationally by Marshall Schmitt. It is obvious that students majoring in industrial education should give more consideration to a minor in mathematics.

## Table 13

## OTHER CLASSES TAUGHT BY INDUSTRIAL EDUCATION TEACHERS

| Class | Number | % |
|---|---|---|
| Not Teaching Other Classes | 1642 | 75.8 |
| Other Administrative Duties, Including Department Chairman | 188 | 8.7 |
| Mathematics | 144 | 6.6 |
| Counseling | 37 | 1.7 |
| Social Studies | 32 | 1.5 |
| Fine Arts and/or Music | 23 | 1.1 |
| Physical Education | 71 | 3.3 |
| General Science | 14 | .6 |
| Biological Science | 8 | .4 |
| Physical Science | 5 | .2 |
| Business Education | 3 | .1 |
| Total | 2167 | 100.0 |

Table 14 shows the areas outside of industrial education in which the teachers believe they have the greatest competency to teach. It is significant that the teachers believe they have the greatest competency in mathematics and that mathematics is the area outside of industrial education where the greatest number are actually teaching.

## Table 14

## AREAS OUTSIDE OF INDUSTRIAL EDUCATION TEACHERS BELIEVE THEY HAVE GREATEST COMPETENCY TO TEACH

| Area | Number | % |
|---|---|---|
| No Answer, or Not Competent Outside Industrial Education | 1277 | 59.1 |
| Mathematics | 290 | 13.4 |
| Physical Education | 174 | 8.0 |
| Social Studies/History | 135 | 6.2 |
| Art | 100 | 4.6 |
| General Science | 50 | 2.3 |
| Natural Science | 30 | 1.4 |
| Biological Science | 24 | 1.1 |
| Foreign Language | 19 | .9 |
| Business Education | 18 | .8 |
| English/Speech | 16 | .7 |
| Social Sciences Combined | 14 | .6 |
| Music | 11 | .5 |
| Mathematics/Science | 7 | .3 |
| English/Foreign Language | 2 | .1 |
| Total | 2167 | 100.0 |

The question was asked of the teachers in what area of industrial education they thought they had the greatest competency to teach. Summary data of this is shown in Table 15. As expected, the greatest number of teachers expressed a competency in the area of wood. This probably indicates a traditional emphasis on this area of industrial education. It is interesting to note that there were well over 100 schools listed as offering a general shop, yet only 70 teachers listed this area as one they felt competent to teach. There are other areas listed as being taught in the schools, yet no teacher listed the area as a competency. Plastic technology is such an example. Perhaps less emphasis should be placed on the traditional areas usually offered in industrial arts and more emphasis placed on some of the newer technologies.

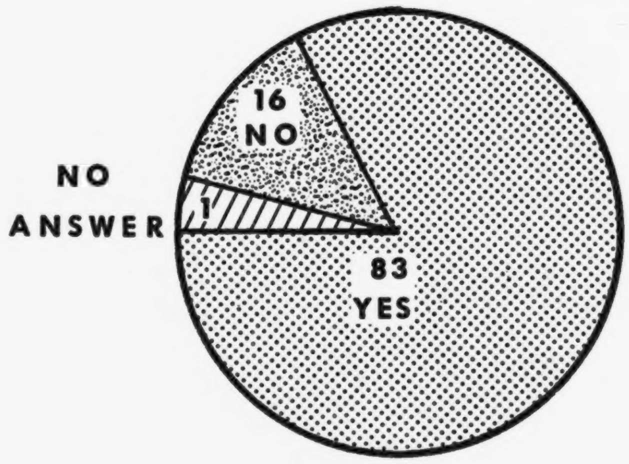


**Figure 4**
**PERCENT OF RESPONDENTS REPORTING WORK EXPERIENCE**

## Table 15

## AREAS OF GREATEST TEACHING COMPETENCY IN INDUSTRIAL EDUCATION

| Area | Number | % |
|---|---|---|
| Wood | 495 | 22.8 |
| Drafting | 425 | 19.6 |
| Metals | 347 | 16.0 |
| Auto | 222 | 10.2 |
| Electricity/Electronics | 213 | 9.8 |
| Graphic Arts | 120 | 5.5 |
| General Shop | 70 | 3.2 |
| Industrial Crafts | 60 | 2.8 |
| Photography | 13 | .6 |
| Power Mechanics | 11 | .5 |
| Drafting/Wood | 50 | 2.3 |
| Wood/Metals | 37 | 1.7 |
| Auto/Power Mechanics | 16 | .7 |
| Electricity/Metal | 12 | .6 |
| Metal/Auto | 14 | .5 |
| Graphic Arts/Drafting | 8 | .4 |
| Graphic Arts/Photography | 5 | .2 |
| No Answer | 49 | 2.3 |
| Total | 2167 | 100.0 |

One of the objectives of both industrial arts and industrial occupations classes is the teaching about industry. Much can be learned about this important phase of industrial education in college, through reading and field trips. However, there can be no substitute for the experience of actually working for wages on an industrial job. Figure 4 shows the number and percentage of respondents who indicated they had some type of work experience.

On inspection of Figure 4 reveals that over 80 per cent of the teachers had some type of work experience.

In order to teach the reimbursed industrial occupations classes in the high school a person must have work experience related to the area he is to teach. The respondents were requested to list each of the jobs which they had held and to indicate the number of months for each. This information is summarized in Table 16.

## Table 16

## RELATED WORK EXPERIENCE LISTED BY THE RESPONDENTS

| Time Month | Number | % |
|---|---|---|
| 1-6 | 144 | 6.6 |
| 7-12 | 108 | 5.0 |
| 13-18 | 77 | 3.6 |
| 19-24 | 133 | 6.1 |
| 25-36 | 162 | 7.5 |
| 37-48 | 139 | 6.4 |
| 49-72 | 187 | 8.6 |
| Over 72 | 457 | 21.1 |
| No Answer | 105 | 4.8 |
| No Related Experience | 655 | 30.3 |
| Total | 2167 | 100.0 |

If the work experience were related to courses which the teacher was presently teaching, it was considered as related work experience. As can be seen, 65 per cent of the respondents possessed work experience judged to be related to that they were presently teaching. A study conducted at California State College Long Beach revealed that 90 per cent of the students enrolled in the industrial arts department had some work experience, with 60 per cent indicating work experience related to their primary area of concentration.

To obtain the 8.1 credential for teaching industrial occupations classes, two years of related work experience is required. Almost 50 per cent of the respondents possessed enough related work experience to qualify for this type of credential. Approximately 42 per cent of the junior high school teachers possessed the required amount of work experience. More teachers in the four-year high schools had the required amount of experience; 48 per cent indicated two years or over. The highest percentage of teachers possessing two years or more of work experience were teaching in the three-year high schools.

Almost 60 per cent of the teachers in three-year high schools reported having at least two years of related work experience. This is not unexpected since most of the three-year high schools are located in urban, industrial areas. In addition, more of the two-hour industrial occupations classes are being taught in the three-year high schools. The responses show approximately a three-to-one ratio in favor of the three-year high school. This ratio may be partially accounted for by the difficulty of fitting the two-hour class into a four-year program because of the space limitation.

Typical teacher activities include many things other than teaching. Industrial arts teachers are no exception, as indicated by Table 17.

### Table 17

### ACTIVITIES IN WHICH INDUSTRIAL EDUCATION TEACHERS HAVE A MAJOR RESPONSIBILITY

| Activity | Number | % |
|---|---|---|
| Industrial Arts Contests | 519 | 24.0 |
| Homeroom | 467 | 22.0 |
| Athletic Contests | 376 | 17.4 |
| Supervise School Grounds | 337 | 15.6 |
| School Club | 289 | 13.3 |
| Class Advisor | 242 | 11.2 |
| School Assemblies | 239 | 11.0 |
| Industrial Arts Club | 236 | 10.9 |
| Coach Athletics | 214 | 9.9 |
| Field Trips | 142 | 6.6 |
| Audio-Visual Council | 82 | 3.8 |
| School Paper | 78 | 3.6 |
| Lunchroom | 65 | 3.0 |
| Yearbook | 37 | 1.7 |
| Student Council | 18 | .8 |
| Bookstore | 13 | .6 |
| No Other Activities | 300 | 13.8 |

There were 300 respondents who indicated that they had no outside activities. The outside activity listed most frequently was industrial arts contests. There were no descriptions given of these activities, but this category probably included such things as automotive troubleshooting contests and industrial arts fairs where awards were given. The list of outside activities in which industrial education teachers participate includes the entire gamut of organized activities that are carried on in the public schools. However, it should be pointed out that many of the teachers who do have outside activities have types of activities directly related to industrial education.

In contrast to the Marshall Schmitt nationwide study which reported a total of 16 per cent of the industrial education teachers coaching athletics, this survey found fewer than 10 per cent engaged in this activity.

One of the concerns of this study was the relationship between industrial arts and vocational trade and technical classes at the high school level. There are two primary areas where the relationship would be of major importance. One such area concerns the teachers for each of these classes.

Many teachers are teaching only industrial arts classes as indicated by Table 18.

### Table 18

### NUMBER AND PER CENT OF TEACHERS WHO TEACH INDUSTRIAL ARTS ONLY

| Response | Number | % |
|---|---|---|
| Yes | 1347 | 62.1 |
| No | 799 | 36.9 |
| No Answer | 21 | 1.0 |
| Total | 2167 | 100.0 |

Slightly over 60 per cent of the teachers indicated that they were teaching only industrial arts. There were 799 teachers who indicated they were teaching other classes as well as industrial arts. However, as indicated by Table 19, approximately one-half of these teachers who were teaching other classes were probably teaching industrial occupations classes.

This would mean that approximately 1700 teachers or almost 80 per cent of the teachers are teaching in some phase of industrial education only. This should make for a strong program of industrial education in California, since it is obvious teachers should be more competent in their major area.

### Table 19

### NUMBER AND PER CENT OF TEACHERS TEACHING INDUSTRIAL ARTS AND OCCUPATIONAL CLASSES

| Response | Number | % |
|---|---|---|
| Yes | 354 | 16.3 |
| No | 1783 | 82.3 |
| No Answer | 18 | .8 |
| Teaching Industrial Occupations or Vocational Preparation Only | 12 | .6 |
| Total | 2167 | 100.0 |

### Programs

As would be expected, industrial arts programs vary widely in title, scope and content. Information from the questionnaires indicated that 39 high schools had industrial arts courses that would meet science requirements for graduation. The course listed most frequently as meeting this requirement was electronics. Courses in drafting and machine shop were also listed as meeting science requirements.

The 39 high schools which had industrial arts courses that would meet science requirements represent 9.6 per cent of the total high schools reported in the study. This was higher than the 4 per cent reported by Schmitt in his nationwide study of industrial arts.

There are certain courses offered in high school which will satisfy a college or university prerequisite for engineering or science. The courses which the respondents indicated as meeting college requirements ar shown in Figure 5:

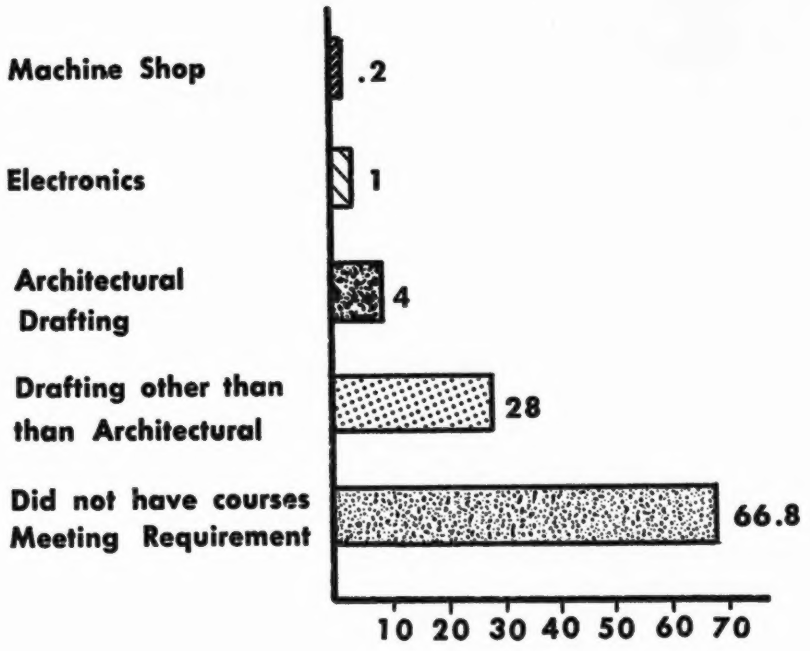


Figure 5

COURSES WHICH MEET COLLEGE OR UNIVERSITY PREREQUISITES

Drafting is the course listed most frequently as meeting college prerequisites. This is not unusual when one considers that drafting is the course most requested by engineering schools.

One of the trends that has taken place in industrial education in the high schools in recent years is the increase in the number of the two-hour industrial occupations class. Of the schools responding, 141 indicated that they had two-hour reimbursed industrial occupations classes as shown in Table 20. An additional question was asked about two-hour industrial arts classes, and there seems to be some confusion in the minds of many administrators as to what type of program they actually have.

### Table 20

### TYPE OF INDUSTRIAL OCCUPATIONS CLASS OFFERED IN THE SCHOOL

| | Offered | | Not Offered | | Total | |
|---|---|---|---|---|---|---|
| Type | No. | % | No. | % | No. | % |
| Two-Hour Class | 141 | 20.2 | 557 | 79.8 | 698 | 100.00 |
| Three-Hour Class | 32 | 4.6 | 666 | 95.4 | 698 | 100.00 |
| Work Experience | 118 | 16.9 | 580 | 83.1 | 698 | 100.00 |
| Two-Hour Industrial Arts Class | 219 | 31.3 | 479 | 68.7 | 698 | 100.00 |

Probably the actual number of two-hour programs lies someplace between the two figures as shown by the types of two-hour programs reported in Table 21.

### Table 21

### TYPES OF TWO-HOUR INDUSTRIAL ARTS PROGRAMS

| Course | No. | % of Total N-405 | % of 2-Hr. Classes N-183 |
|---|---|---|---|
| Automotives | 74 | 18.2 | 40.4 |
| Wood | 37 | 9.1 | 20.3 |
| Metals | 25 | 6.2 | 13.7 |
| Electronics | 14 | 3.5 | 7.7 |
| Graphic Arts | 11 | 2.7 | 6.0 |
| Drafting | 10 | 2.5 | 5.5 |
| Machine Shop | 8 | 2.0 | 4.4 |
| General Shop | 2 | .5 | 1.0 |
| Photography | 1 | .2 | .5 |
| Plastics | 1 | .2 | .5 |
| Did Not Have Two-Hour Classes | 222 | 54.9 | ...... |
| Total | 405 | 100.0 | 100.0 |

As shown in Table 21, 405 respondents indicated either an area for their two-hour programs or indicated they did not have this type of program. This was an open-end question which asked merely for the area in which they offered the program or an indication of no program being offered.

The greater number of two-hour programs was listed as being in automotives. The three most frequent areas listed were automotives, wood, and metals. This is not surprising, as there are the areas in which many teachers explain that one hour is just not enough time to accomplish anything because of the setup time involved. In addition, drafting and woodworking are two of the traditional areas that are offered as industrial arts in most of the schools.

Some schools require industrial arts classes for all their students. Other schools have industrial arts as an elective class. By and large, it has been traditional for more industrial arts classes to be required at the junior high school level than at the senior high school level. Likewise, industrial arts at the high school level has been largely an elective program. In the last few years, however, there has been a decrease in the number of required industrial arts classes at the junior high school level. This has been brought about largely by the addition of legislative mandated courses, such as foreign language. Obviously, if something is added, something else must be deleted or the school day lengthened. For this reason several school districts have changed industrial arts from a required course to an elective course. This has been reported by several city supervisors in the state.

The required courses listed by the respondents are shown in Table 22:

### Table 22

### JUNIOR HIGH SCHOOL REQUIRED COURSES LISTED BY AREAS

| Course | Number | %* |
|---|---|---|
| Woodworking | 189 | 67.0 |
| Drafting | 169 | 60.0 |
| Metals | 163 | 57.8 |
| Electricity | 107 | 38.0 |
| Graphic Arts | 64 | 22.7 |
| Crafts | 43 | 15.2 |
| Power Mechanics | 6 | 2.1 |
| Automotives | 1 | .3 |

*Based on the responses of 282 junior high school principals.

The courses listed most frequently as being required in the junior high school are wood, drafting, and metal. It is encouraging to note the number of schools which require electricity at the junior high school level. There are, however, a large number of schools which have a general comprehensive program at the junior high level. These have been shown previously and are not reflected in the totals in this table. From all indications, the number of general comprehensive programs will increase at the junior high school.

In addition to those schools which require certain industrial arts courses, most schools have several elective industrial arts classes. Many schools have a basic required course in industrial arts, followed by several elective courses in industrial arts from which the students may choose.

Table 23 shows the number of elective courses in the various areas for 698 respondents.

## Table 23

## ELECTIVE INDUSTRIAL ARTS COURSES

| Course | Junior High School | High School |
|---|---|---|
| Drafting | 135 | 516 |
| Woods | 169 | 486 |
| Metals | 211 | 440 |
| Electricity | 98 | 362 |
| Automotives | 11 | 342 |
| Graphic Arts | 63 | 183 |
| Crafts | 87 | 129 |
| Power Mechanics | 13 | 125 |

Again as expected the most frequently offered courses are drafting, woods, and metals. It is encouraging to note that there are 125 programs in the area of power mechanics in the high school. Power mechanics is an area that needs more definition, as it was found that some of the power mechanics programs were used as a basic, beginning course and other power mechanics courses were used as the last, or most advanced course in the automotive sequence.

Several of the respondents indicated that they planned to add new industrial arts courses to their curriculums. The number of courses and areas are shown in Table 24. The course listed most frequenty, almost two to one, is in the area of electricity/electronics. This would seem logical with the current emphasis on electricity/electronics.

## Table 24

## NUMBER OF PRINCIPALS PLANNING TO ADD COURSES

| Course | Number of Schools |
|---|---|
| Electricity/Electronics | 41 |
| Power Mechanics | 23 |
| Automotives | 22 |
| Graphic Arts | 20 |
| Metals | 16 |
| Crafts | 7 |
| Drafting | 7 |
| Wood | 7 |

As can be seen by an inspection of Table 24, the areas that will have the fewest number of new programs are the traditional areas of drafting, crafts, and wood. However, there are in existence large numbers of drafting and wood programs. The area of crafts appears to be losing its popularity. This may be due to an orientation away from the activity approach in some areas of industrial arts. Recently, however, there has been a change in emphasis in many of the crafts programs, more toward a study of new industrial materials and their application. In some schools the crafts program has remained handicraft oriented and is used as a class for EMR students and slow-learning groups. There probably is justification for keeping these classes with this handicraft orientation for this type student.

There has been some movement in California, as well as in other parts of the country, to substitute courses in plastics technology or industrial materials for these in the industrial arts program. This re-orientation will, no doubt, continue as more emphasis is placed on industrial concepts and processes in the industrial arts curriculum.

Even though many districts are adding new courses, there are some problem areas. Unfortunately, there are some districts closing shops. The respondents to the questionnaire indicated several reasons for facilities being closed. These are shown in Figure 6.

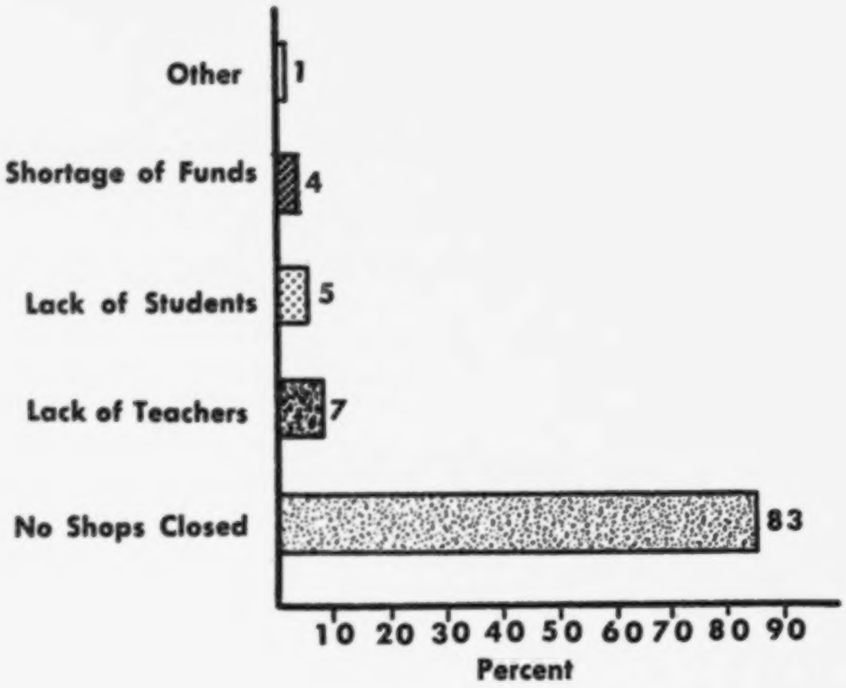


Figure 6
**REASONS FACILITIES HAVE BEEN CLOSED**

The reasons given most frequently for a facility being closed was lack of a teacher. Other reasons in order were lack of students and shortage of funds. Almost 17 per cent of the principals responding indicated that they had one or more facilities closed for some reason.

The most frequently listed reason, lack of teachers, probably can be accounted for by the declining number of qualified teacher education graduates from the state colleges. With the implementation of the new credential law in November, 1962, the number of graduates who could qualify for the credential started to decline. There seems to have been a steady decline in the number of teachers graduated each year thereafter until the number dropped to a low of approximately 120 in 1967 while the demand rose to over 600. This would account for some districts not being able to employ a teacher, even if they recruited from out of the State of California.

Another factor affecting the supply of teachers is the current conflict and draft. Students are currently being deferred until the completion of four years of college, but are then subject to draft call. This would affect potential teachers from both California and out of state.

Lack of students is probably most frequently caused by the addition of other required courses within the curriculum. However, the lack of interest on the part of the student may also be attributed, in some cases, to either a poor program or a poor instructor and these causes cannot be completely disregarded.

Shortage of funds has been listed as a cause for facilities being closed by 29 of the respondents. This lack of funds probably could be attributed to several causes, not the least of which has been the defeat of several bond issues and tax overrides in the past two years. The courses need to be well thought out and well taught, and the teacher needs to communicate well with fellow teachers and the administration.

## Students

The most important aspect of any educational program is the student. The types of students who take industrial arts probably have some influence on the type of program which is offered.

In many junior high schools at least one course in industrial arts is required of all boys. In these programs the student's ability covers the entire range. The principals were asked to judge the ability range of the students who take industrial arts classes. Table 25 shows the ability range by level reported by the principals. As indicated earlier, many junior high schools require a course in industrial arts, therefore all ranges would be represented in the classes so the question would not be applicable.

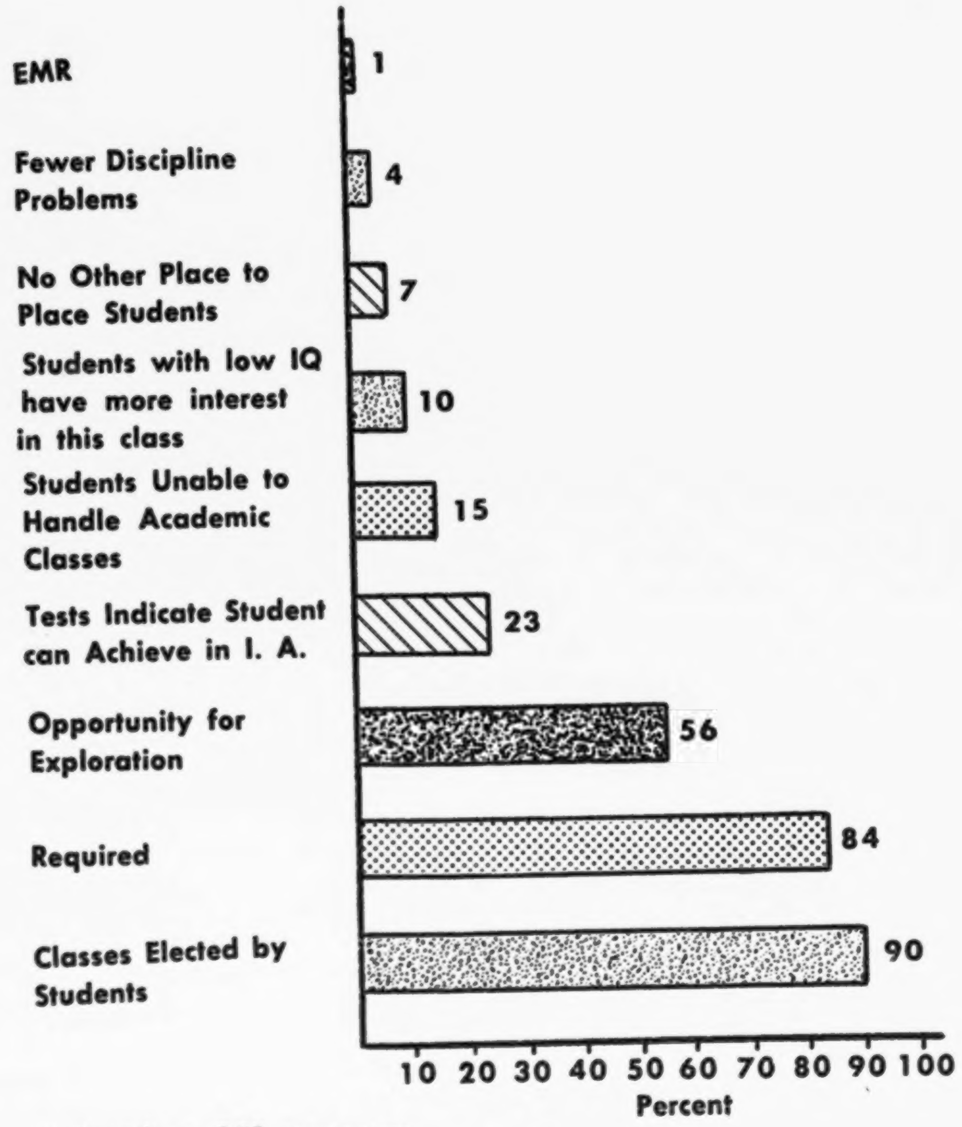
### Table 25

### ABILITY RANGE OF STUDENTS TAKING INDUSTRIAL ARTS CLASSES

| | Ability Range | | | |
|---|---|---|---|---|
| Level | Above | Middle | Below | Not Applicable |
| Junior High School | 3 | 59 | 6 | 193 |
| Four-Year High School | 3 | 204 | 55 | 16 |
| Three-Year High School | 1 | 101 | 30 | 5 |

As can be seen from an inspection of Table 25 most of the principals report the ability range of the students falls predominantly in the middle or average category. More respondents reported students of low ability than of high ability take industrial arts. Probably this is partially due to some schools having special industrial arts classes for slow learners and the educable mentally retarded. The old complaint of industrial arts teachers that they get all of the poor students does not seem to be borne out from the data in this study. This, however, may still be true in some schools because of the way students are scheduled or because of homogeneous grouping.

The reasons students are programmed into industrial arts reveals, to some extent, the philosophy of the administration about industrial arts classes. Figure 7 shows the reasons the principals checked for programming students into industrial arts classes.



* Based on 253 responses

Figure 7

REASONS JUNIOR HIGH SCHOOL STUDENTS ARE PROGRAMMED INTO INDUSTRIAL ARTS

Most of the students are programmed into industrial arts because it is required or because the students elect the course. In many schools a student is required to take a course in industrial arts, but he may elect the area he wishes to take.

This would account for both required and elected being listed most frequently. It is interesting to note that 17 principals indicated that students were programmed into industrial arts because there was no other place to put them. This would seem a poor reason for placing a student in ANY class.

It is also to be noted that ten principals indicated students were placed in industrial arts classes because this results in fewer discipline problems. This may be a fine compliment to industrial arts teachers, but again it would seem a poor reason for scheduling a student into these classes.

In contrast to the junior high schools there are few industrial arts classes required at the high school level. In those high schools where industrial arts is required it is usually in the form of one beginning class which may be elected by the student from several available courses.

The reasons listed by the high school principals for programming students into industrial arts classes are shown in Figure 8. The greatest number of students are programmed in industrial arts courses as an elective. The reasons for students taking industrial arts courses are probably not mutually exclusive. For example, students may elect their classes, but their selection may be based on test results which indicate that the student can achieve in industrial arts; or it may be based on the student's interest in exploring one area of the program to see if he likes that class; or it may be that the student has had experience in industrial arts classes at the junior high school level and has developed an interest in this area.

Unfortunately, not all students can enroll in industrial arts classes even though they might wish to do so. In some schools, if the student elects the college preparatory track there is no opportunity to elect courses in industrial arts.

A problem arises over the opportunity for elective courses because many schools base college preparatory courses of study on university requirements. Yet most of the students attend either a community or a state college where the entrance requirements are less stringent. It would seem that if industrial arts is indeed a part of general education it should be available to all.

Table 26 indicates the number of schools where the course pattern allows student electives.

## Table 26

## STUDENTS ALLOWED TO ELECT INDUSTRIAL ARTS

| | Course Pattern Allows Elective | | | | | |
|---|---|---|---|---|---|---|
| | Yes | | No | | Total | |
| Grade Level | No. | % | No. | % | No. | % |
| Junior High School | 235 | 33.6 | 47 | 6.7 | 282 | 40.3 |
| Four-Year High School | 241 | 34.6 | 38 | 5.5 | 279 | 40.1 |
| Three-Year High School | 118 | 16.9 | 19 | 2.7 | 137 | 19.6 |
| Total | 594 | 85.1 | 104 | 14.9 | 698 | 100.0 |

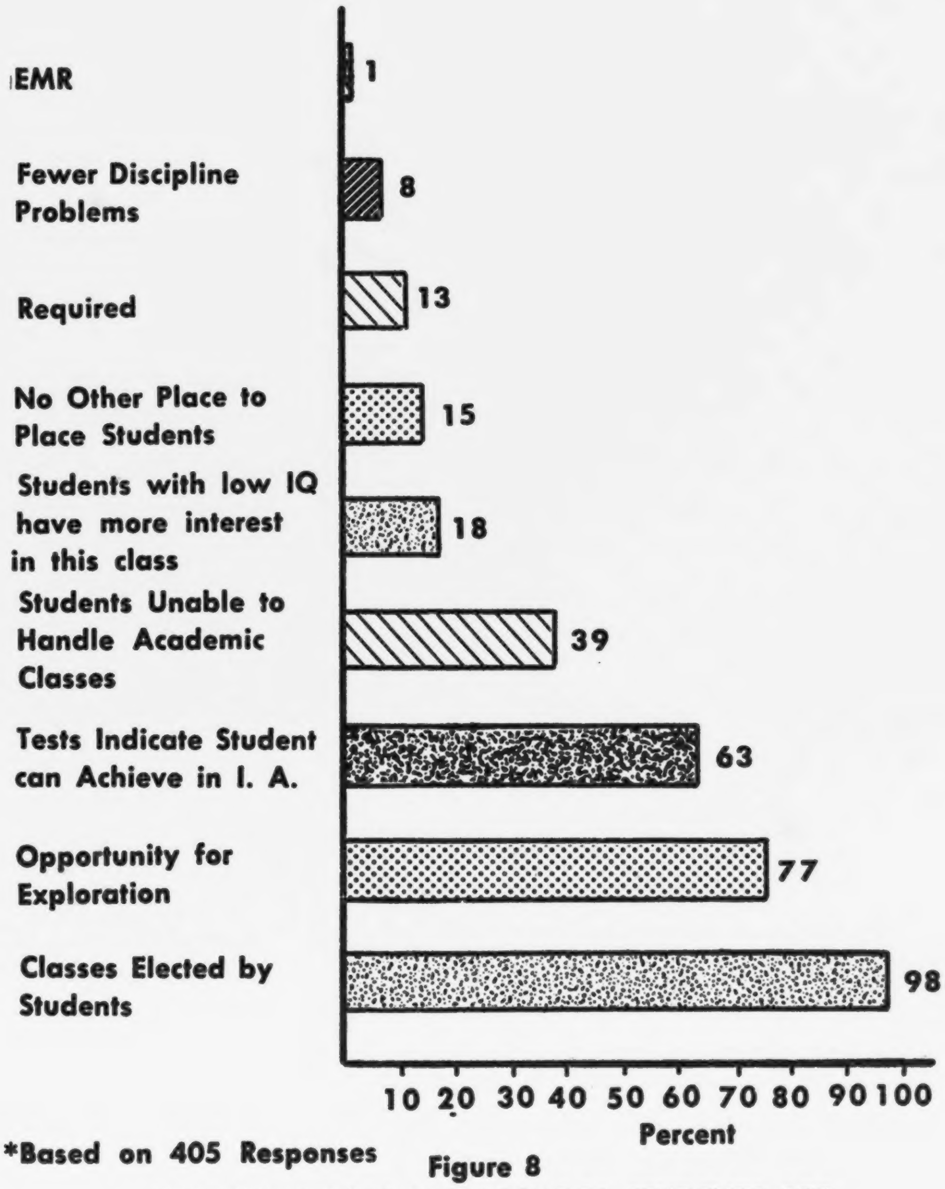


Figure 8
REASONS SENIOR HIGH SCHOOL STUDENTS ARE PROGRAMMED INTO INDUSTRIAL ARTS

The principals were asked who they thought profited from a good industrial arts program. The majority of the respondents reported that all students could profit from a good industrial arts program. There were, however, 57 of 594 respondents who indicated that all students but college preparatory students could profit from industrial arts. The number who believed this way were evenly distributed between junior and senior high schools.

Many of the principals made comments concerning the desirability of having all boys take industrial arts. Some typical comments were:

1. It is an excellent exploratory experience for all boys.
2. A program of skills and dexterity training is essential for all early adolescents.
3. Industrial arts teachers have a good understanding of ALL students and work well with students.
4. Courses required for many careers.
5. Leads to occupational preparation.
6. Good for both boys and girls.

These are a few of the comments concerning the benefits of industrial arts. There were a few principals who stated that industrial arts was best suited to slow learners and those not intending to go on to college. One stated that the individuals who believed this were definitely in the minority.

In recent years there have been several new instructional techniques developed, tried and in some cases discarded. Some of the techniques usually reported in the literature are shown in Table 27.

### Table 27

### INSTRUCTIONAL PRACTICES USED IN SCHOOLS

| Practice | In Use No. | In Use % | Planned No. | Planned % | Will Not Use No. | Will Not Use % | No Answer No. | No Answer % |
|---|---|---|---|---|---|---|---|---|
| Flexible Program | 76 | 10.9 | 211 | 30.2 | 215 | 30.8 | 196 | 28.1 |
| Team Teaching | 221 | 31.6 | 189 | 27.1 | 130 | 18.6 | 158 | 22.7 |
| Open Laboratory | 95 | 13.6 | 146 | 20.9 | 234 | 33.6 | 223 | 31.9 |
| Small Group Instruction | 242 | 34.6 | 137 | 19.6 | 142 | 20.3 | 177 | 25.5 |
| Independent Study | 157 | 22.6 | 139 | 19.9 | 186 | 26.6 | 206 | 30.9 |

The technique being used least was flexible scheduling. The utilization of this technique will probably increase slowly because of the necessity of changing the entire scheduling process of a school before it can begin. Team teaching, on the other hand, is a technique that can be practiced by the teachers with a minimum of rearranging of the present program. The practice is one that is being tried in more and more industrial arts programs. It would seem to be a worthwhile practice to incorporate into the occupational preparation programs as well as into the industrial arts program.

Associated with new instructional practices are the use of various pieces of audio-visual equipment. As indicated in Table 28, almost every school has 16mm projectors available. It is interesting to note the number of schools which have 8mm equipment available. The use of the new super 8mm film and closed loop machines is on the increase. As new films become available there is every reason to believe that the 8mm concept will become more popular.

## Table 28

## TYPES OF AUDIO-VISUAL EQUIPMENT AVAILABLE IN THE SCHOOL

| Type Equipment | Now | Planned | Neither |
|---|---|---|---|
| 16mm | 686 | 0 | 12 |
| 8mm | 113 | 21 | 564 |
| 35mm | 627 | 4 | 67 |
| Overhead Projector | 677 | 6 | 15 |
| Opaque Projector | 596 | 6 | 96 |
| Closed TV | 51 | 40 | 607 |
| Video Tape | 43 | 55 | 600 |
| Teaching Machines | 14 | 15 | 699 |

The audio-visual medium most schools are contemplating adding is some form of television. The video type unit seems to be the type of television equipment most frequently being considered as an addition and with the reduction in the cost there will undoubtedly be more schools buying this type of audio-visual equipment.

Audio-visual equipment, especially the new closed circuit TV and video tape units, are an integral part of many of the new programs such as the American Industry program of Stout State University and the Industrial Arts Curriculum Project of Ohio State University. If all or portions of these programs are adopted by many of the California schools there will surely be an increase in the frequency of use of several types of audio-visual equipment.

Table 29 indicates the ability level of the students enrolled in junior and senior high school programs as reported by teachers. As can be seen by an inspection of this table, few teachers in either junior or senior high school indicate they have students of above-average ability.

## Table 29

## ABILITY RANGES OF STUDENTS REPORTED BY TEACHERS

| | Junior High School | | Senior High School | |
|---|---|---|---|---|
| | N | % | N | % |
| Above | 12 | 1.8 | 16 | 1.2 |
| Middle | 260 | 39.3 | 556 | 37.8 |
| Below | 181 | 27.3 | 525 | 35.7 |
| Above and Middle | 8 | 1.2 | 17 | 1.2 |
| Middle and Below | 82 | 12.2 | 234 | 15.9 |
| All Ranges | 68 | 10.3 | 53 | 3.6 |
| No Answer | 51 | 7.7 | 68 | 4.6 |
| | 662 | 100.0 | 1469 | 100.0 |

The percentage in the high-ability group is lower as reported by California teachers than for the nation as a whole, as reported by Marshall Schmitt in his study.

As expected, more junior high school teachers than high school teachers reported they had all ranges of ability in their classes. Since industrial arts is required in many junior high schools, this would be expected. By far the largest percentage of teachers indicated their students were average or below in ability.

This coincides quite clearly with what Schmitt found in his study.

No reasons were given for the lack of above-average students in classes. However, some possible causes may be postulated. Perhaps the present programs are not offering material which challenges the high-ability student. It is possible the counselors are scheduling more low-ability students into these classes on the assumption this is the best place for low-ability students.

Principals indicated in response to the principal's questionnaire that they thought industrial education was of benefit to everyone, but it appears this feeling does not carry over into the area of scheduling.

Table 30 shows the amount of time devoted to theory and practice in junior and senior high schools.

## Table 30

## PERCENTAGE OF CLASS TIME DEVOTED TO THEORY AND CONSTRUCTION

| | Junior High School | 3-Year High School | 4-Year High School |
|---|---|---|---|
| Amount of time devoted to theory | 21.4 | 27.7 | 24.0 |
| Amount of time devoted to construction | 71.3 | 64.1 | 70.5 |

As expected, the junior high school teachers spent a greater amount of time on construction activities than senior high school teachers. It is interesting to note that teachers in three-year high schools devote more time to teaching theory than the four-year high school. It is possible that the first year in a four-year high school is taught more like the junior high school. It is also possible that, at least for the above-average student, more time should be given to instruction in theory than is true at the present time.

Table 31 indicates the average number of hours devoted to school duties by the teachers. The greatest amount of time spent by teachers at all levels is spent in classroom instruction.

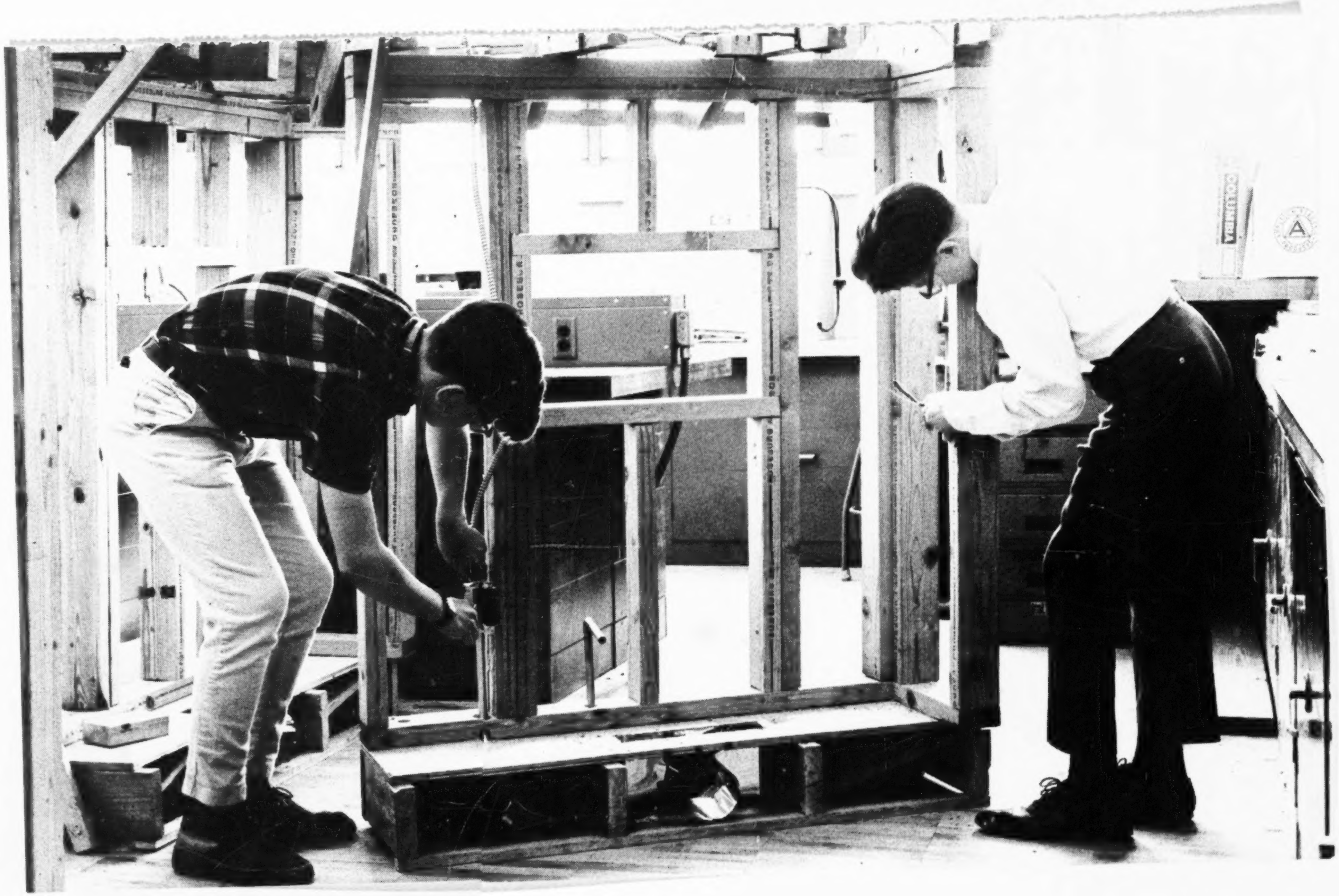
However, there is a difference in the numbers of hours spent on shop maintenance and class preparation between junior high school teachers and senior high school teachers. The junior high school teachers spend about one hour less per week in each of these categories than do the high school teachers. It is interesting to note that the teachers in four-year high schools spend about one hour more per week on extracurricular duties than do either junior high school or three-year high school teachers. Teachers at all levels spend very close to 40 hours per week in activities at the school. This does not include time spent on school work away from the school, such as grading tests and preparing instructional material at home.

## Table 31

### AVERAGE NUMBER OF HOURS DEVOTED TO SCHOOL DUTIES BY JUNIOR-SENIOR HIGH SCHOOL TEACHERS

| | Mean | | |
|---|---|---|---|
| Duty | Junior High Schools | 3-Year High Schools | 4-Year High Schools |
| Hours per week teaching | 25.6 | 25.4 | 25.8 |
| Hours per week shop maintenance | 3.7 | 4.2 | 4.1 |
| Hours per week class preparation | 6.4 | 7.2 | 7.5 |
| Hours per week extracurricular duties | 2.4 | 2.8 | 3.6 |

Based on the data from the questionnaires it appears that the industrial arts instructional program is too narrow in scope. This study reveals a concentration of instruction in the traditional subject areas of drawing, wood, and metal. To improve the overall program at the junior-senior high school levels more instructional content should be included in areas such as graphic arts, electricity/electronics, power mechanics/transportation, industrial plastics and photography. Each of these represents an important area of study for general education purposes as well as occupational exploration for vocational guidance purposes.


COLUMBIA

## CHAPTER III

# Current Innovations and Related Programs and Studies

At the present there are many studies pointing toward changes in industrial education nationwide. In order to determine the nature of the recommendations, studies and programs under way, considerable research and some visitations were made. The programs were investigated to determine if there were implications for California. There is no attempt to recommend changes in present programs but to indicate some of the research that is being conducted that might be of interest to industrial educators. In relation to this study, the material presented is confined to secondary programs in industrial education, industrial arts, vocational trade and technical, and occupational programs.

## CURRICULUM DEVELOPMENT

At the present time there are many curriculum studies being carried on in the United States. A few of the curriculum projects from other sections of the country have been received and are reported here on the assumption that they may have some implications for curriculum development in California.

### American Industry Project

One of the largest of the experimental programs being carried on in the field of industrial education is the American Industry Project which is being conducted at Stout State University in Menomonie, Wisconsin. This project has been defined as a conceptual approach to teaching about American industry. The objectives of the program are (1) to develop in the student an understanding of industry and (2) to develop in the student the ability to solve problems.

The source of content for the program is industry and not technology. Using industry as a source of content for the program instead of technology produces a much broader based program than the conventional industrial arts program.

It was the assumption of the people directing the project that all industries have common elements regardless of the products they distribute or the services they render. One of the tasks of the project has been the identification and classification of these elements into a logical structure. This structure incorporates thirteen major elements or groupings of knowledge which can be isolated and studied, but which are interrelated.

Each of these areas is further divided into a conceptual model. These models identify a hierarchy of the concepts which are present in each area. This material is used to develop curriculum for the secondary schools.

Presently they are developing a three-level curriculum. The first level attempts to develop a broad foundational understanding of industry, and second level will be an in-depth study of the major conceptual areas and the third level will allow the student to do research and experimentation in one or more of the conceptual areas.

The major goal of the first level is to build general knowledge of the conceptual structure of industry, develop the ability to solve problems related to industry and create an understanding of the relationship of industry to the lives of all members of our society. Students study processes rather than specific skills and materials rather than woods or metals. In addition, they are exposed to concepts of research, finance, management, and communications. There are currently 20 programs in the secondary school of Wisconsin and Minnesota.

The objective of the second level course is to attain a more sophisticated understanding of the concepts of industry. Developmental work is currently under way on curriculum material for this level.

All teaching techniques are used in the teaching of the program. Heavy reliance is placed on audio-visual materials including video tape and closed-circuit television.

Follow-up studies are planned as part of the evaluation of the project. As more evaluation is done on the project, changes may occur. The value of any program is its worth to the student and, hopefully, eventually the benefit to the student will be evaluated.[1]

## Cluster Study

The cluster concept is a curriculum approach being investigated by Donald Maley of the University of Maryland.

This project, Phase I of a series of studies, was initiated to study the cluster concept as a form of secondary vocational education. The initial phase was aimed at determining the acceptability and feasibility of the cluster approach, as well as identifying several occupational clusters. The final section, not contained in this report, is directed toward developing a series of course outlines for selected clusters.

The term, "cluster concept," is described as the development of skills and understandings related to a number of allied fields. The skills and understandings would be common to a number of the occupations in the field. However, it is not an in-depth development into any one job. The "cluster concept" differs from the conventional vocational program in terms of scope and depth, preparing a person to enter into a family of occupations rather than a specific occupation.

The first objective was to describe the appropriateness of the cluster concept as a program in vocational education at the secondary school level.

The second objective was to identify occupational clusters and the specific occupations in each cluster that would be suitable for a cluster-concept program in vocational education at the secondary school level. To satisfy this objective, three steps were taken:

1. A review and evaluation of research was conducted in the area of occupational grouping.
2. A method of research, based upon a sampling technique proposed by Altman and Gagne of the American Institute for Research, was developed to determine occupational clusters.
3. A group of three occupational clusters, with their respective selected occupations, was identified for further analysis.

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[1] Wesley L. Face, "The American Industry Project," paper read at AIAA Convention, Philadelphia, March 14, 1967.

Among the findings of this investigation, based primarily upon the responses to interviews, was the indication that the cluster concept was feasible and could be implemented in the secondary schools with little difficulty. "Representatives from labor and industry indicated that students with a cluster concept background could obtain employment and would be able to advance and specialize through on-the-job training and apprentice programs."

After reviewing several occupational classification systems, the investigators concluded that the occupational clusters could best be developed from a list of criteria. Criteria were established for the purpose of identifying occupational clusters and their specific occupations. These criteria indicated that the occupational clusters should:

1. Lie in the area of vocational industrial education.
2. Include occupations that are related on the basis of similar processes, materials and products.
3. Be broad enough to include occupations having a wide variety of skills and knowledge.
4. Involve occupations that require not more than a high school education and/or two years beyond high school.
5. Provide the opportunity for mobility on a geographical and occupational basis.

The occupations in each cluster must have:

1. A favorable employment outlook.
2. The instructional capability of being implemented in a secondary school program.
3. Opportunity for job entry upon graduation from high school.
4. Numerous skills and knowledge providing opportunity for the identification of commonalities with other occupations.
5. Opportunities for advancement through further schooling, on-the-job training or apprentice programs.

As a result of applying the criteria to a group of possible occupational families and specific occupations within the groupings, the following clusters with their respective occupations were established:

Electro-mechanical installation and repair cluster: (a) business machine serviceman, (b) radio and television serviceman, (c) home appliance serviceman, (d) air conditioning and refrigeration serviceman.

Metal forming and fabrication cluster: (a) welder, (b) sheet metal worker, (c) machinest, (d) assembler.

Construction cluster: (a) carpenter, (b) plumber, (c) mason, (d) electrician, (e) painter.[2]

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[2] Donald Maley, "An Investigation and Development of the Cluster Concept or a Program in Vocational Education at the Secondary Level," American Vocational Journal, 43:40-41, February 1968.

## Industriology

Another different approach for teaching about industry is being tried at the Wisconsin State University at Platteville. According to Dr. Jack Kirby, director of the project, their program was originally planned to bring a more realistic study of industry to the small school. This program they call Industriology. This is an attempt to take the main areas of industry and teach about these rather than teach specific processes. The program is divided into four phases. Phase I is the beginning overall view of industry. Phase II is a modular approach in which certain aspects of Phase I are studied in greater depth. Phase III is an intensive in-depth study of one industry. This might be similar to the occupation preparation classes being conducted at the high school level in California. Phase IV has not been developed up to this time.

Phase I would probably begin in the junior high school, but could begin later. It would be the first course about industry no matter at what level it was offered. Audio-visual materials play a very important role in this program. Video tape and slides are used to show actual scenes of industry and industrial processes.

The Industriology program is in many respects similar to the American Industry Project being conducted at Stout State University. It may be that both of these programs would have desirable features which could be adapted or adopted by the schools of California.[3]

## Industrial Arts Curriculum Project

Another of the large curriculum projects that is currently under way is the Industrial Arts Curriculum Project, funded by the U.S. Office of Education and administered by the Ohio State University.

For this project industry has been viewed as the chief source of subject matter for industrial arts. Because of this, the researchers believe, industrial arts programs have drifted toward the study of a few selected skills in industry-related crafts and trades and the materials and processes.

There is a gap between industry and the present industrial arts programs. Because of this the students are not receiving instruction that is a true study of industry. The study group feels that industry has never been structured beyond the material and process stage for industrial arts teachers. For this reason the study staff have developed a rationale for the systematic structuring of a body of knowledge for the organized study of industry.

One of the domains of man's knowledge, the study group has called praxiological. This area contains all the knowledge of practice. Praxiology is the field of applied knowledge that draws upon the other areas. Since the initiation of the project the field of applied knowledge is no longer called praxiology, but is now referred to as technology.

The technology is then broken down into sub-elements for teaching. In turn each of the sub-elements is further broken down.

The project has taken into account six general factors or elements in the selecting and organizing of learning experiences for the industrial arts. These are: (1) the structure of the body of knowledge, (2) objectives of instruction,

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[3] Jack Kirby, Project Director, Industriology Project, Wisconsin State University at Platteville, personal interview, January 1968.

(3) the nature of the learner, (4) school facilities and materials, (5) instructional procedures and materials, and (6) measurement and evaluation.

The objectives of the Industrial Arts Curriculum Project are to:

1. Identify and structure that knowledge to be included in a study of industry.
2. Prepare a program outline of selected elements of that knowledge—industrial technology.
4. Improve the instructional system through field testing in selected industrial arts programs.
5. Develop a program for the preparation of teachers.

Initially, several assumptions were made regarding industrial arts. They were: (1) it is just as important to study the man-made world as it is to study the natural world, (2) industry, which creates the man-made world, is an important complex part of society, (3) man has been and remains curious about industry, and (4) industrial arts is a study of industry and an essential part of the education of all.

The first task of the project staff was to separate industrial knowledge from all of man's knowledge. The project staff then structured this knowledge and named it industrial technology. Industrial technology provides a source of subject matter for industrial arts.

Industrial technology is the knowledge used to satisfy man's wants for industrial material goods. It was found that man uses this knowledge in two principal activities—construction and manufacturing. To provide an understanding of these industrial divisions, the first course for junior high school students is "The World of Manufacturing."

### Vicoed

Dr. Ray Schwalm is also working on a conceptually oriented and interdisciplinary organized curriculum called VICOED. Essentially, VICOED is an extension and expansion of graphic arts education, to include many other disciplines which directly or indirectly affect the visual communication process, such as art, anthropology, economics, mathematics, chemistry, English, journalism, speech, sociology, physics, psychology, and industrial arts. He sees visual communication as the organizing agent for his concepts. Concepts apply to the conception, development, production, use and evaluation of the effect of any type of visual communication in such a way that once understood for one type they aid in understanding all forms of visual communications.

The curriculum effort is under way in several high schools and colleges with the following programs:

A two-year curriculum for students in grades 11 and 12 who plan to continue their formal education in a college or university or who intend to enter industry after high school graduation.

A two-year technology curriculum at the college level, offering students a choice of going to work in industry at the end of two years or transferring to a four-year institution for a degree in visual communications.

An interdisciplinary teacher education curriculum for those who plan to teach visual communications in the public schools.

By testing the curricula at various levels, the project staff hopes to produce model curricula in visual education for high schools, community colleges, technical institutes, and four-year colleges which may be introduced in other areas throughout the country.[4]

Kishkunas and Olsen spoke of the total occupational, vocational, and technical curriculum in the Pittsburgh public schools. Here, it seems, industrial arts subjects in the junior high school grades emphasize exploration to permit a selection by the student of one of three high school tracks—occupational, vocational, or technical. In the high school, industrial arts courses become preparation for work in the occupational track by providing experiences for grouping of semi-skilled and service occupations.

Turnquist reported on a program conceived for the Detroit public schools which is similar to the effort in Pittsburgh. There, too, one can see the use of industrial arts courses in a pre-vocational and vocational sense. These programs were developed in response to serious educational manpower problems within these school systems and cities. Creative and forward-looking educators are working in these locales and their work should be studied carefully. Possibly, with the solution of immediate problems, school systems may change or add to the current emphasis in industrial arts programs in the junior and senior high schools.[5]

In the field of plastics, Runnalls (1965) analyzed and described the production processes and materials used in the plastics industry and determined the extent to which industrial arts teacher educators gave instruction related to the body of knowledge he derived. He found it relatively simple to derive the content and suggested that processes can be determined and modified into instructional content. Results of his survey of teachers in education institutions, however, indicated that only 14 departments required a course in plastics for their industrial arts majors, while 73 departments indicated that there were some instructional units in plastics included in other courses.[6]

In summary, diverse views of industrial arts are apparent in curriculum development. To some, it is a motivating activity; to others, an occupational or pre-occupational subject; some view it as general education which serves all students while making provisions for different abilities; some derive its content from a broad interpretation of technology or American industry, while others derive content from a delimited analysis of man's practices in industry in converting materials to products; some analyze processes and materials of specific industries to derive content and others analyze functions common to many industries. While the curriculum situation appears eclectic, it seems that the ongoing curriculum research and development programs may lead to a much-needed agreement on the values of industrial arts. Once the values are accepted, the various approaches which are and will be suggested for the achievement of value objectives will, of course, need to be tested empirically.

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[4] "VICOED, A Pilot Program in Visual Communication," Western Washington State College (mimeographed).

[5] "Review and Synthesis of Research in Industrial Arts" (Columbus, Ohio: The Center for Vocational and Technical Education, 1966), page 13

[6] Ibid.

## RELATED STUDIES

Studies similar to the present one have been conducted in several other states. Some of these are now several years old, others have been completed within the last two years. The methods employed to conduct the studies have varied widely. Several were completed by personnel within the state. Several were conducted by contracting with outside agencies. In addition to the state studies, one national study was completed for the United States Office of Education by Marshall L. Schmitt and Albert L. Pelley.

A nationwide study of industrial arts was reported in 1966. This study was conducted by Marshall L. Schmitt and Albert L. Pelley of the United States Office of Education. A summary of the findings is reported here for comparison purposes with the present study in California. Some of the findings are:

Three-quarters of the American public secondary schools have industrial arts programs. A definite relationship exists between the size of the school and the frequency of industrial arts programs: As the size increases, the number of schools with industrial arts programs increases also.

Industrial arts can be substituted for science credits in only about 4 per cent of the public secondary schools.

Of over 40,000 industrial arts teachers in public secondary schools, 94.4 per cent hold a regular or standard teaching certificate. More than twice as many industrial arts teachers with master's degrees teach in schools which have enrollments of over 2500 students than in schools which have enrollments from 100 to 199 students. Nearly 20 per cent of the industrial arts teachers have 20 semester hours or less in technical courses, and 21 per cent have 10 semester hours or less of combined science and mathematics courses.

The average number of years of teaching experience for industrial arts teachers is 9.5 years. The larger schools have the most experienced teachers. The average number of years of industrial experience or its equivalent of industrial arts teacher is 5.6.

Industrial arts teachers have many responsibilities other than teaching industrial arts. In small schools it is not uncommon for industrial arts teachers to be the athletic coach or a homeroom or class advisor. Few industrial arts teachers have responsibilities in the school council, school paper, or student bookstore.

As the size of the school decreases, industrial arts teachers are called upon to teach non-industrial arts classes such as general science, biology, social studies, geometry, and algebra.

Industrial arts teachers rate the ability of their students in elective industrial arts classes as follows: 10 per cent of the students were generally above average; 57.9 per cent, average; and 31.9 per cent, below average.

From 25 to 30 per cent of the instructional time in industrial arts classes is devoted to theoretical or related instruction; conversely, 70 to 75 per cent is devoted to laboratory activities. Industrial arts courses meet generally a full school year, five days a week, for one period a day.

Concentration of subject content in industrial arts is centered in the three areas of woodworking, drafting, and metalworking.

Some of the conclusions reached by the investigation were:

The current industrial arts instructional program is too narrow in scope. Not only is the content narrow with respect to course offerings, but the instructional content within the courses themselves is not as broad as the professionals in the field recommend. This study reveals a concentration of instruction in the traditional subject areas—such as drawing, woods and metals. To improve the program, more instructional content should be reflected in the subject areas of graphic arts, electricity/electronics, and power mechanics. These newer subject areas relate to the modern technological achievements in communicatitons and in power and transportation.

Although this study did not deal with the depth of instructional content, it does cast some light on the background of the teacher. More industrial arts teachers need to strengthen their science and mathematics backgrounds and keep up with advances in technology.

Although this study is a status report on industrial arts education in the public secondary schools in the United States, one major fact stands out: The current industrial arts curriculum does not even measure up to the program recommended by the profession 10 to 20 years ago. Yet the new curriculum suggests new structures which would reorganize the instructional content to reflect the technology around the emerging subject areas in manufacturing, communications, power and transportation, electricity/electronics, and research and development.[7]

One of the first studies completed in the last decade was one conducted by Robert Rudiger in Wisconsin. Data for this study were obtained from records of the State Department of Education and from a questionnaire sent to each of the industrial arts teachers at the seventh and eighth grade level. He found that 57.7 per cent of the schools have in-service teacher education programs. Sixty-six per cent of the teachers reported their students were below average in ability.

Rudiger made several conclusions from his study. Generally these include a need for upgrading and updating the industrial arts instruction in Wisconsin. There is need for more and better supervision at both the local and state level. There should be more and better guidance, especially vocational guidance. He states that the industrial arts program should be broadened.

Many of the problems encountered by industrial arts teachers in Wisconsin are common problems encountered in other states. Some of the areas stated by Rudiger as problems and some of the findings from this study are similar to problems and findings in the present study of industrial education in California.[8]

A more recent study was conducted in Utah and was concerned with the total program of vocational education in the state. The study was carried out by the Division of Surveys and Field Services of the George Peabody College for Teachers and completed in 1966.

The study included all phases of vocational education and industrial arts. In general it was found that the program in industrial arts has been strongly supported in Utah, but the program had too much emphasis placed on the woods area and the program was too traditional in content and teaching methods. There were some areas of industrial arts that were not being taught at all.

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[7] Marshall L. Schmitt and Albert L. Pelley, "Industrial Arts Education, A Survey of Programs, Teachers, Students and Curriculum (Washington: Government Printing Office, (Menomonie, Wisconsin: Stout State University, 1961).

[8] Robert Rudiger, "Status of Industrial Arts in the Public Secondary Schools of Wisconsin" 1966).

The Peabody group indicated that there was a need for curriculum specialists at the state level in both industrial arts and vocational education. In addition they recommended a state plan be developed for industrial arts in the State of Utah.

With respect to vocational education, it was determined that enrollment in high school vocational programs in trade and industrial subjects was increasing. However, the number of programs was limited and the course offerings were limited to a few exceptions determined by the industrial arts facilities which were available for holding the classes. They also indicated a need for more vocational guidance counselors.

There were 24 specific recommendations made in the study pertaining to industrial arts. These included recommendations for re-direction of the present curriculum to suggestions for more help from the state level for the local district. There were three specific recommendations for trade and industrial education in the Utah high schools. Cooperative training programs were recommended for the smaller schools where there were not enough students interested in specific occupations for establishing a program in the school.

Several of the recommendations made concerning the State of Utah could very well apply to California. For example, there is evidence to support the need for more industrial arts supervision at either the state or county level in California.[9]

A study of vocational-technical education in Missouri was also completed in 1966. This study was conducted by the Field Service Center of the School of Education, University of California. The study was concerned only with vocational education in Missouri, but was reviewed because of the methodology employed and the findings concerning vocational education at the high school level.

It was found that there was a need for additional vocational education courses in the high schools. This recommendation parallels recommendations from other studies and parallels what is actually being done in other states.

It was recommended in the study that area vocational schools be established only to supplement the program in the high schools and never at the expense of the high school programs. The vocational classes at the high school level should begin at the eleventh grade.[10]

In 1964 the Legislature of the State of Hawaii passed a resolution requesting the Legislative Reference Bureau study vocational and technical education in Hawaii. This was to include a description of the present program, evaluation of the present program and the development of goals. The study was conducted by observation, interviews, questionnaires, and a search of the relevant literature.

In this study it was found that industrial arts was listed as general education or exploratory by the administrators with the additional task of preparing students to go on to post high school trade training. The investigator questions the fact that industrial arts is really general education based on material included in most curriculum guides. Some suggested revisions and changes in the curriculum and in vocational education in Hawaii were postulated.[11]

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[9] "Vocational Education in Utah" (Nashville, Tennessee: Division of Surveys and Field Services, George Peabody College for Teachers, 1966).

[10] J. Chester Swanson, Denis J. Kigin and Marvin R. Fielding, "A Gateway to Higher Economic Levels" (Berkeley, California: Field Service Center, School of Education, University of California, 1966).

## RELATED PROGRAMS

Another aspect of this study was to inspect programs in cities, counties, and states around the county. Basically all states have some programs similar to programs in California. However, there are differences and for this reason selected programs are reported here.

Paul W. Briggs, Superintendent of Cleveland Public Schools, stated, "The need to equip today's schools for tomorrow's jobs requires that course offerings be continually reviewed and expanded." The overall program pictured here represents an expansion since 1964 from 37 vocational programs in two schools to 125 classes in 1968 with every high school offering some type of vocational education. Approximately 20 per cent of the eleventh and twelfth grade school population is being served.

William R. Mason, Director Techniacal - Vocational Education, stated, "Technical - vocational education in Cleveland brings together the many paths of occupational, technical, and vocational education and coordinates them into one broad avenue of effort. Cleveland schools have also extended vocational programs into the comprehensive high schools, thereby making them truly comprehensive by including numerous areas of skill training and technology. It is the announced objective of the Cleveland schools to bring training for employment within convenient geographic reach of all who desire it.

Industrial arts - occupational education in the Cleveland junior and senior high schools is prevocational as well as a practical approach to the study of industry and some of the ramifications involved. It deals with the areas of manufacturing and construction through studying and working with industrial type tools, materials, processes, products, and problems that are related to these areas. Emphasis is also placed on the students understanding and participating in career orientation experiences.

In this sense, industrial arts - occupational educational training leads to or becomes pre-vocational; students, through these classes, meet the prerequisites for entering the regular vocational classes established for the eleventh and twelfth grade students.

In the junior high school, seventh and eighth grade students in industrial arts - occupational education take courses in woods, plastics, graphic arts, drafting, metals - basic mechanics. Students in grades 9-12 may elect courses in any area of interest.

Many of the courses are structured as vocational occupation courses. These courses are geared to the potential drop-outs or students who are achieving below average. By obtaining specialized training in single-skill courses, an effort is made to equip these students with necessary job-entry skills and attitudes for placement in industry or to reorient them to the regular educational program. Included among these courses is an Occupational Work Experience Program, wherein pupils spend one-half day in school and one-half day in a job in industry or business commensurate to their abilities. In the occupational courses, academic areas are correlated with occupational shops in an effort to make them more meaningful to the student.

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[11] Dorothy L. Moore Edlin, "Education in a Changing World of Work in a Democratic Society" (Legislative-Reference Bureau, Honolulu, Hawaii, 1966).

Many high school graduates enter employment directly as a result of industrial arts training. Those who do not graduate usually become full-time employees as a result of part-time placement while attending schools.

In September 1966, the Cleveland school system expanded the comprehensive high school program by establishing "area skill centers." These centers carried the system a long step closer to its announced goal of "bringing training for employment within convenient geographic reach of all who desire it."

Technical and industrial education is preparation and training for initial employment in specialized, trade and technical occupations courses in aviation, auto, machine shop, welding, electricity, electronics, drafting, painting.

All technical and industrial courses are two years in length and start at the eleventh grade. Logical candidates for technical and industrial training are (1) boys who upon graduation from high school expect to enter the labor market and (2) boys with interest, desire, and capability to benefit from such training.

According to recent follow-up studies, all technical and industrial graduates have had little or no difficulty finding gainful employment.[12]

In order to determine the present programs and trends in states and communities outside of California, individual and group interviews were held with supervisors of school districts in other states. One such group interview was with Seattle, Washington, supervisors, T. W. Hodgson, Director of Industrial Arts; C. L. Paulsen, Supervisor of Industrial Arts; and Allen Duncan, Director of Occupational Education.

There are twelve high schools and seventeen junior high schools in Seattle with 125 industrial arts and occupational teachers. The major emphasis in industrial arts centers around woods, metals, drafting, and electricity, with some courses in crafts in the junior high school and power mechanics in senior high school. The immediate area of growth will be in the areas of electricity-electronics, automotives, and graphic arts. The biggest problem that might delay implementation of these programs is the lack of teachers in these areas.

On October 24, 1966, the Board of Education adopted the following policy statement for occupational education:

Secondary schools should not exist solely to bridge the gap between elementary schools and institutions of higher learning. Secondary schools should provide educational experiences which will assure the discovery of vocational aptitudes and interests and assist in their development. Experiences in regard to vocational opportunities. Such occupational education should be available to all who need and want it.

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[12] "Training Today's Students for Tomorrow's Jobs" (Cleveland: Cleveland Public Schools), 1967.

**It is the policy of the Seattle School Board to make occupational education available in the secondary schools as an integral part of the curriculum.**

This policy, through its implementation:

— provides the broad spectrum of educational experiences which students need to identify and develop career potentialities.

— assists students in making wise career choices.

— helps the student recognize that education is a lifelong process and that development of one's self to maximum capacity is desirable.

— assists in the development of saleable abilities for those who find it appropriate to step out of the school program on or before graduation.[13]

Since the VEA Act of 1963, six schools have started two-hour programs in assembly mechanics and three schools have two-hour programs in machine operation. These programs are offered in the twelfth grade and require prerequisites of industrial arts drafting. They utilize advisory committees in planning these programs and placement may either lead to entry jobs on advanced training in the junior college. Additional programs for the future in occupational education are planned in the areas of drafting and automotive servicing.

There will be no attempt to replace industrial arts programs with occupational programs and the same facilities will not be used unless there are open periods for the occupational programs. At the present time, there is great flexibility in credentialing for the occupational programs. Occupational programs are being considered for low-ability students as well as average and above-average-ability students. They do not plan to build vocational schools but will utilize comprehensive high school and business from one school to another for particular programs.

There are some schools in Seattle that are organized for flexible scheduling. According to the supervisors, this type of organization has reduced the time allocated for laboratory work in industrial arts but has increased the number of students that can enroll in industrial arts. Some of the problems in this program include reduced time for lab work, problems in attendance procedures, clean-up and issuing supplies.

The long-range plans of the Seattle schools in industrial education include continued growth in industrial arts and occupational programs. They are working very closely with all levels, from kindergarten to junior college, to provide an articulated program. Occupational information, career guidance, and knowledge of the world will start at the elementary level and will become a very important area at all levels. The industrial arts program will increase its offerings and provide programs for all levels of students regardless of future goals. Occupational programs will continue to grow and provide programs for entry level occupations.[14]

An experimental pre-technology curriculum has been tried in Richmond, California, schools. This program which has sometimes been called the "Richmond Plan" has tried to use a form of vocational education as a motivational device. In other words the academic high school is being used to provide a form of vocational education.

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[13] Policy statement, Seattle Public Schools, October 24, 1966 (mimeographed).

[14] T. W. Hodgson, Director Industrial Arts, Seattle Public Schools, personal interview, January, 1968.

The program tries to coordinate technical and academic subjects into a workable relationship. The program also uses the shop program to dramatize the relationship between theory and practice. The shops are used as an adjunct to the other areas, not as an integral part of the program in their own right.

Again with this program, as with many others, heavy emphasis is placed on audio-visual materials and some of the newer teaching techniques such as team teaching and programmed instruction.

Originally pre-engineering was chosen as the area for experimentation. However, the program is now being used in less complex fields. One of the fields being used is the training of persons for careers in hotels and restaurants. This is a two-year program and is called Project FEAST (Food Education and Service Technology).[15]

Project Capstone is the name given to the job-entry training program in the Wisconsin high schools. The Vocational Education Act of 1963 provided the opportunity for the program to be started.

The Department of Public Instruction entered into an inter-agency agreement with the State Board of Vocational, Technical and Adult Education as part of the state plan. The Department of Public Instruction established a vocational education program unit and employed a program administrator to head the division, plus supervisors to oversee the program in each occupational field, business, distributive, trade and industrial, home economics and agriculture.

A steering committee was established at the state level and it was agreed that the capstone courses would be developed at the twelfth grade, and that the job cluster concept would be the objective. In the 1966-67 school year, there were 115 participating schools.

One city has articulated its total industrial arts program, grades 7 through 12, with post high school training. They have established a committee to coordinate these programs with post high school programs.

Presently the emphasis is being placed on the guidance function and on students with special needs. There was a professional growth week conducted during the summer for the local coordinators which focused on guidance programs.

Mr. Richard Roberts, Supervisor of Trade and Industrial Education, states: "While there still remains much to be accomplished, there is little doubt that "Operation Capstone" has had a dynamic impact on educators in the State of Wisconsin. The need has been emphasized by the Governor and the State Superintendent of Schools in their many speeches. It has involved all the supervisors in the Department of Public Instruction. This impact will leave a lasting mark on the comprehensive high schools throughout Wisconsin."[16]

One of the new concepts being introduced in many areas of the country is the middle school. With increasing frequency, the school districts of this nation are making the decision to abandon the junior high school as presently organized in favor of some type of "middle school." This change in grade pattern is not a small isolated incident in educational practice; with the announcement that the vast New York City system will drop the present 6-3-3 plan and adopt a 4-4-4 plan (four grades each in elementary, middle and high school), a trend is definitely established.

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[15] Dale C. Draper, "Educating for Work, A Report on the Current Scene in Vocational Education" (Washington, D. C.: National Association of Secondary School Principals), 1967.

[16] Richard Roberts, "Wisconsin's Project Capstone," School Shop, 27:25-27, December, 1967.

The exact grade composition of the new middle school is still not firmly fixed in actual practice, although grades 6, 7, and 8 are often included, with grade 5 sometimes being added, as in the case of New York City.

Marshall Schmitt has compiled figures (1) which indicate that the greatest concentration of enrollment in industrial arts is found in present junior high school grade 9, with enrollments falling off sharply thereafter. With a shift in grade level for this school, many questions arise: How will new school organizations (5-3-4, 4-4-4, 6-2-4) affect the enrollments, programs and practices of industrial arts at all grade levels? Will the middle school offer new opportunities that have been unavailable or unpracticed in the junior high school? Will industrial arts face the future in this confusing situation by clinging to the practices of the past, only offering these practices one year earlier?[17]

If the middle school concept continues to grow there will certainly be implication for change in industrial education in California.

## TRENDS

From the review of the literature, several trends become apparent. Industrial education is on the move and the byword seems to be growth and change.

Curriculum seems to be the area evidencing the greatest change. Several of the studies and curriculum projects are concerned with interpreting and placing more emphasis on understanding industry. Another indication of this trend is the emphasis on interpreting industry in each of the NDEA institutes that are being conducted in colleges and universities. Across the country greater use of textbooks, field trips and new audio-visual materials have contributed toward the goal of a better understanding of industry.

Until recent years, instruction in plastics in the school shop was limited to a large extent to craft activities with thermoplastic materials. Today, however, the modern course in plastics is oriented toward the broad spectrum of plastic products available in industry. All forms of plastics are being used with many different manufacturing methods.

One of the major objectives of industrial arts has always been that of understanding industry. However, for many years very little attempt was made to relate completely what is done in the school shop to the functions of industry. More recently there have been real endeavors made to implement this particular objective.

Many industrial arts programs reflect a sincere endeavor to give students some experiences relating to engineering and manufacturing. Often this requires a combined effort in the various courses in industrial arts experiences around a hypothetical manufacturing company set up in the school.

Studies indicate that vocational education, especially the industrial occupations program, will continue to place more emphasis on the family of occupations or the job cluster type of program.

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[17] Samuel R. Porter, "The School in the Middle," Journal of Industrial Arts Education 28:26-27, November-December, 1967.

Both the studies and interviews with consultants agree that there will be more emphasis on occupational information and career guidance at all levels of education.

There will be a change in the industrial education teacher of the future. He will have a good formal collegiate education, a sound background in general education, industrial experience and will continue to improve his competence by additional in-service education.

## CHAPTER IV

# Relationship of Industrial Arts to Vocational Trade-Technical Education

The State of California has long been recognized as a leader in the field of education—in industrial education as well as in other aspects of education. This leadership has resulted not only from California's favorable economic position and its appreciation of the importance of human resources, but also from a pioneering spirit and a willingness to adapt programs and procedures to meet new and evolving conditions.

The State of California has for many years used the term industrial education as encompassing industrial arts and vocational trade-technical education. Industrial education is an integral part of the total program of education and has as its major purpose the preparation of youth and adults for responsible participation in our industrial society and the training of youth and adults for occupations and professions. Industrial education derives its content from the tools, instruments, machines, materials, processes, power, occupations and know-how that makes industry function. Industrial education has been defined as a generic term including industrial arts education at all levels and trade and technical education (high school industrial occupations programs, trade and technical programs in the community college and industrial technology at the state college level).

With the passage of Public Law 88-210 many new programs have been started in trade and technical education. Notable among these is the increase in the number of high school occupational programs in the eleventh and twelfth grades.

Over the years there has been considerable disagreement between industrial arts teachers and trade-technical teachers as to the relationship between these two programs. Therefore, one of the purposes of this study was to attempt to determine what this relationship should be. This chapter will cover information concerning the relationship between industrial arts and trade and technical education as reported in the questionnaires, from interviews with leaders in these areas and a review of pertinent literature.

One of the primary areas of concern was to investigate the relationships which exist between the industrial occupations, programs in the high schools and the industrial arts programs at this same level. It is obvious that there should be a great many similarities between the two programs even though the two might have, to a large extent, different objectives.

First, the industrial occupations classes and the industrial arts classes are usually taught in the same room or laboratory. In most cases the industrial occupations classes were started in an existing industrial arts facility; it takes the time when the facilities could be used by two industrial arts classes. In many of the districts, however, the school day was lengthened so there were no classes as such eliminated.

If this industrial occupations program is to continue and to grow, there will probably need to be more facilities made available in the local districts. It would be worthwhile to initiate a study to determine what type of facility and equipment would be optimum for each of the occupational areas.

Since most of the industrial occupations classes are being taught in facilities that were designed for industrial arts classes, this means in most cases a sharing of facilities between the two programs. By and large this seems to work to the advantage of the industrial arts classes since a portion of the money allocated from the federal funds can be used for the purchase of equipment. The equipment is used by the industrial occupations classes and also by the industrial arts students. In some cases this has made equipment available to industrial arts students which would not have been available otherwise.

The nature of the industrial occupations program is different than the vocational trade program. The industrial occupations program involves the family of occupations concept rather than training for a specific trade. As an example, the industrial occupations metal program would probably closely resemble an industrial arts general metal program in which some sheet metal, some machining, some foundry, some welding and a great deal of related material would be taught. This is in contrast to the straight vocational trade program in which one area, for example, welding, would be taught for the entire course.

Because of the nature of the industrial occupations program and the family of occupations concept, it probably fits better into the existing industrial arts facility than into a trade-technical facility. This then makes necessary a close relationship between the existing industrial arts program and these new programs. In addition, since most of the industrial occupations programs have been started where there was an already existing industrial arts program, there has been some articulation between the two since they exist in the same facility. It appears to be the usual pattern to have a student complete a year or two of an industrial arts program before enrolling in one of the industrial occupations programs. In this way the student would have a basic knowledge of tools, processes, measurements and attitudes. The industrial occupations program then would build upon this industrial arts foundation. Supposedly then the industrial occupations class could involve more technical work since the student had completed the basic training in industrial arts. Here probably is one of the most important relationships between the two programs. The industrial arts classes, or at least one class in industrial arts, should be a recommended elective prior to enrolling in an industrial occupations class. On the other hand, no student should be excluded from an industrial occupations class because he had not had a class in industrial arts.

One of the requirements of all vocational reimbursed programs is the development of a process to select the students. The industrial arts classes could be used as one method of student selection. This appears to be one of the weaknesses in the existing program and one which should probably be given some attention in the near future.

In an effort to determine what differences, if any, exist between the two programs in the areas of curriculum, methods and teachers, several questions were included on the questionnaire sent to the teachers.

Table 32 shows the highest degree earned by both the high school industrial arts teachers and the industrial occupations preparation teachers. An inspection of Table 32 will reveal little difference between the two groups with the exception of the first two categories, no degree and A.A. degree. By far a higher percentage, 12 per cent, of the industrial occupations teachers have less than a bachelor's degree. It is interesting that 2.6 per cent of the industrial arts teachers at the high school level do not possess a minimum of a bachelor's degree.

### Table 32

### HIGHEST DEGREE EARNED BY HIGH SCHOOL INDUSTRIAL ARTS AND INDUSTRIAL OCCUPATIONS TEACHERS

| Degree | Industrial Arts N | Industrial Arts % | Occupational N | Occupational % |
|---|---|---|---|---|
| No Degree | 25 | 2.2 | 32 | 8.7 |
| A.A. Degree | 5 | .4 | 12 | 3.3 |
| B.A. Degree | 460 | 39.9 | 148 | 40.4 |
| B.S. Degree | 152 | 13.2 | 39 | 10.7 |
| B.V.E. Degree | 11 | 1.0 | 9 | 2.5 |
| M.A. Degree | 415 | 36.0 | 107 | 29.2 |
| M.S. Degree | 82 | 7.1 | 18 | 4.9 |
| Ed.D. Degree | 1 | .1 | 1 | .3 |
| Other | 1 | .1 | 0 | 0.0 |

One measure of professionalism of the members of any profession is their interest in further study. Table 33 indicates the number and percentage of the teachers in each group who are working toward a degree.

### Table 33

### PERCENTAGE OF RESPONDENTS WORKING TOWARD A DEGREE

| Response | Industrial Arts N | Industrial Arts % | Occupational N | Occupational % |
|---|---|---|---|---|
| Yes | 400 | 34.7 | 138 | 37.7 |
| No | 736 | 63.9 | 223 | 60.9 |
| No Answer | 16 | 1.4 | 5 | 1.4 |
| Total | 1152 | 100.0 | 366 | 100.0 |

A slightly higher percentage of industrial occupations teachers are working toward a degree. This probably can be accounted for by the fact that there is a slightly higher percentage of this group who do not have a bachelor's degree and to keep their teaching credential valid they must complete a minimum of six units of work toward a degree per year. This, however, would not account for the entire number, therefore it is safe to assume that many of these teachers as well as many industrial arts teachers are working towards an advanced degree. Unfortunately, no data is available to indicate the exact number in each group who are working toward an advanced degree. There appeared to be little difference between the two groups of teachers concerning degrees.

To determine the relationship between the two groups of teachers based on teaching experience, data was gathered relative to the number of years each teacher had been teaching. The years of teaching experience for industrial arts and industrial occupations teachers are shown in Table 34.

## Table 34

## YEARS OF TEACHING EXPERIENCE FOR HIGH SCHOOL INDUSTRIAL ARTS AND INDUSTRIAL OCCUPATIONS TEACHERS

| Years | N<br>Industrial Arts | % | N<br>Occupational | % |
|---|---|---|---|---|
| 0-1 | 75 | 6.5 | 18 | 4.9 |
| 2-3 | 149 | 12.9 | 44 | 12.0 |
| 4-5 | 137 | 11.9 | 44 | 12.0 |
| 6-10 | 317 | 27.5 | 100 | 27.3 |
| 11-15 | 179 | 15.5 | 67 | 18.3 |
| 16-20 | 135 | 11.7 | 43 | 11.7 |
| 21 and Over | 112 | 9.7 | 33 | 9.0 |
| No Response | 48 | 4.2 | 17 | 4.8 |
| | 1152 | 100.0 | 366 | 100.0 |

An inspection of Table 34 reveals little difference in the amount of teaching experience between the two groups. The mean number of years of teaching experience for the industrial arts teachers was 10.2 years. The mean number of years of teaching experience for the industrial occupations teachers was 10.4 years. This would hardly be a significant difference.

To obtain a credential to teach the industrial occupations classes, a teacher must have a minimum of two years of related work experience. It was thought there would be a difference between the two groups of teachers based on this criterion. The percentage of respondents of both groups who report work experience, either related or unrelated, is shown in Figure 9.

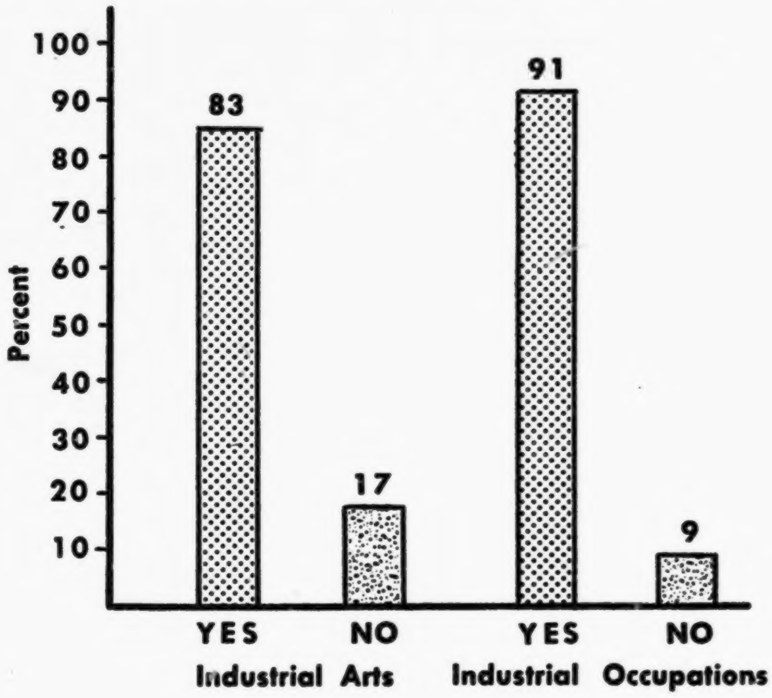


Figure 9
WORK EXPERIENCE OF RESPONDENTS

A greater number of industrial occupations teachers report work experience than industrial arts teachers. This is to be expected since work experience is required to teach a reimbursed occupational class. It is encouraging to note that 83 per cent of the industrial arts respondents report work experience. It would seem logical to conclude that a person who had worked for a wage in some industry would be in a better position to "interpret" industry than one who had not.

One of the requisites for the 8.1 credential to teach industrial occupations classes is related work experience. The number of months of related work experience for both industrial arts and industrial occupations teachers is shown in Table 35. As can be expected, there are few occupational preparation teachers reporting less than twelve months of work experience. Approximately 11 per cent of the respondents teaching industrial occupations classes reported less than two years of teaching experience. It is assumed that these teachers are teaching in the non-reimbursed classes. The mode for the industrial occupations teachers is in the interval 24-36 months, whereas the mode for the industrial arts teachers was in the interval over 72 months. The mean number of months of related work experience reported by the industrial occupations teachers was 33.3 months. It would seem that there are a good many industrial arts teachers who could qualify to teach the occupations classes if they so desired and could meet the other requirements for the credential.

### Table 35

### RELATED WORK EXPERIENCE OF RESPONDENTS

| Months | Industrial Arts N | Industrial Arts % | Occupational N | Occupational % |
|---|---|---|---|---|
| 1-6 | 69 | 6.0 | 4 | 1.1 |
| 6-12 | 69 | 6.0 | 3 | .8 |
| 12-18 | 42 | 3.6 | 34 | 9.3 |
| 18-24 | 73 | 6.3 | 65 | 17.8 |
| 24-36 | 86 | 7.5 | 106 | 28.9 |
| 36-48 | 72 | 6.3 | 70 | 19.1 |
| 48-72 | 97 | 8.4 | 31 | 8.5 |
| Over 72 | 219 | 19.0 | 16 | 4.4 |
| No Related Experience | 365 | 31.6 | 6 | 1.6 |
| No Answer | 60 | 5.3 | 31 | 8.5 |
|  | 1152 | 100.0 | 366 | 100.0 |

Both the industrial arts and the industrial occupations classes are taught in the high school. As stated before, many are taught by the same instructors. Therefore, it would seem that there should be a great similarity between the time spent in the classroom, on maintenance and extra class duties between the two types of teachers. Table 36 shows the average number of hours devoted to school duties for the two groups of teachers.

## Table 36

## AVERAGE NUMBER OF HOURS DEVOTED TO SCHOOL DUTIES

| Duty | Mean Hours Industrial Arts | Mean Hours Industrial Occupations |
|---|---|---|
| Hours Per Week Teaching | 25.63 | 25.96 |
| Hours Per Week Shop Maintenance | 3.91 | 4.66 |
| Hours Per Week Class Preparation | 7.03 | 7.11 |
| Hours Per Week Extracurricular | 2.95 | 3.14 |

As can be seen by an inspection of Table 36, the mean number of hours actually spent is almost identical for the two groups. The occupational group spends about one-half hour more per week on maintenance than the industrial arts teachers. This may be because in most cases they have more complicated equipment to maintain. In all other activities the two groups do not vary by more than 15 minutes per week.

Both industrial arts and the industrial occupations classes involve a certain amount of theory or related information and a certain amount of manipulative or skill work. Since the industrial occupations classes are concerned with developing a higher degree of knowledge about a particular area than are the industrial arts classes in many instances, it might be expected that the teachers who teach the industrial occupations classes would devote more time to theory and knowledge. The mean number of hours devoted to theory and construction are shown in Table 37.

## Table 37

## AMOUNT OF TIME DEVOTED TO THEORY AND CONSTRUCTION

| Time | Industrial Arts | Industrial Occupatons |
|---|---|---|
| Percentage of Time Devoted to Theory | 23.41 | 26.14 |
| Percentage of Time Devoted to Construction | 69.41 | 66.25 |

It must be pointed out that the industrial arts group includes 685 junior high school instructors. The percentage of time devoted to construction in the junior high school is usually higher than in the high school, which may account for a portion of the difference in the time allotted to theory between the industrial arts teachers and the industrial occupations teachers. Again, however, there is a close relationship between the two programs as to the amount of time spent on these two activities.

As indicated earlier, many of the industrial occupations programs in the state are reimbursed from Public Law 88-210 funds. There are, however, programs which the teachers classify as occupational preparation that are not using Federal funds, as indicated by Figure 10.

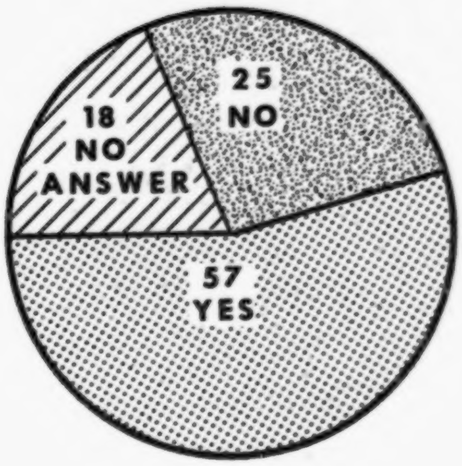


Figure 10

PERCENT OF FEDERALLY REIMBURSED INDUSTRIAL OCCUPATIONS COURSES

Of the 366 respondents who indicated they were teaching industrial occupations classes, 208 indicated that their programs were receiving reimbursement.

As stated, the objectives of the industrial occupations program are twofold: to develop in the student entry level skills and to enable the student to transfer to the trade-technical program at a junior college. The teachers teaching in the industrial occupations program were asked which of these was the PRIMARY objective that most nearly described their course. Figure 11 shows the response of the teachers.

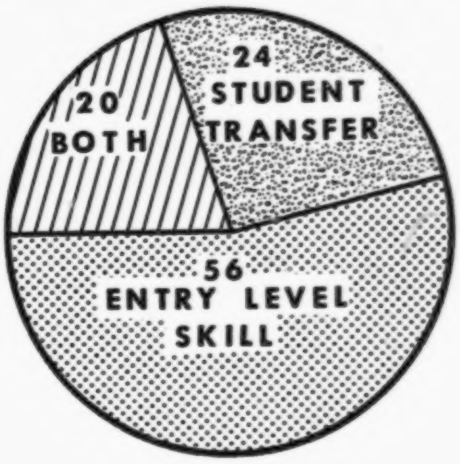


Figure 11

OBJECTIVES OF THE INDUSTRIAL OCCUPATIONS PROGRAM

Over one-half of the respondents indicated the primary objective of their course was entry level skills. When this response was combined with those indicating that the primary objective of their course was both entry level skill and transfer ability, over three-fourths of the teachers indicated that developing minimum entry level skill was of major importance in their course.

It would seem that if training for entry level skills was one of the major objectives of the program, then job placement should logically follow. Figure 12 shows the percentage of respondents who indicated that they gave assistance in obtaining either full or part-time employment.

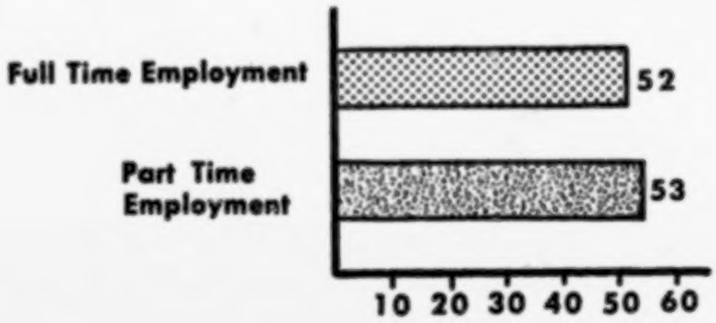


Figure 12

PERCENT OF RESPONDENTS ASSISTING INDUSTRIAL OCCUPATIONS STUDENTS OBTAIN EMPLOYMENT

Only slightly over 50 per cent of the respondents indicated that they gave assistance in finding employment. At first glance this would appear to be a poor showing and not meeting one of the objectives of a good vocational program. However, it should be pointed out that some schools have counseling offices which assist in placement. Even so, it would appear that if, indeed, entry level skill development were one of the major objectives of the program, then more attention should be paid to this aspect.

Only a small percentage of the industrial arts teachers indicated they assisted students toward obtaining full-time employment. However, a greater number did indicate that they assisted students toward obtaining part-time employment. These statistics seem to indicate that there is more emphasis placed on obtaining employment by the industrial occupations preparation teachers. This is as it should be, since one of the major objectives of the occupations program is preparation for entry level employment

There were 415 teachers who indicated that they had prerequisites for their industrial arts courses. These were listed for advanced courses and usually took the form of a beginning course in the same area, a general industrial arts course or, in some cases, a drawing course. There were over 800 industrial arts teachers in the high school who indicated they required no prerequisites.

If an industrial education program is articulated, there are usually prerequisites for the upper level advanced courses. Over 71 per cent of the respondents indicated that they did not have a prerequisite for their occupations classes, as shown by Figure 13.

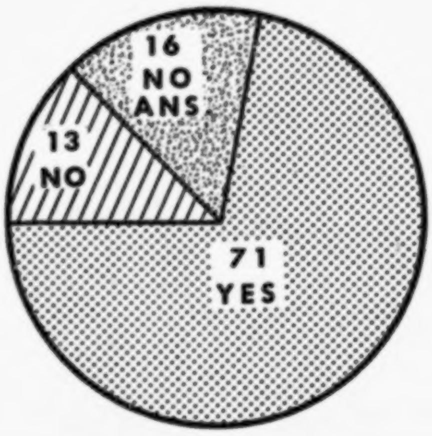


Figure 13
PREREQUISITE REQUIRED FOR INDUSTRIAL OCCUPATIONS CLASSES

By and large, the prerequisite involves an industrial arts class in the same subject, a general industrial arts class or a drawing class. Teachers of many occupations classes listed no required prerequisites. However, they did recommend the student have some previous experience.

The percentage of respondents who indicated they had worked with a community college in articulating their program is shown in Figure 14.

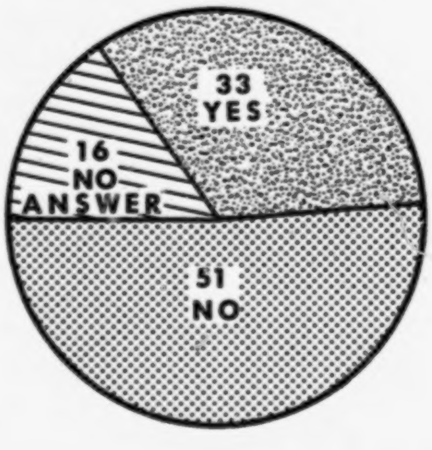


Figure 14
AMOUNT OF ARTICULATION BETWEEN INDUSTRIAL OCCUPATIONS PROGRAM AND COMMUNITY COLLEGE

In contrast to the responses of the community college deans of instruction who reported that 56 per cent of the colleges had made an attempt to articulate their program with the high school industrial occupations program, only 33 per cent of the high school instructors indicated that they had worked with a community college. Obviously, even if the figure of the community college were used, there is need for more articulation. Perhaps the real degree of articulation and working together lies at some point between the two figures.

One of the important phases of both industrial arts and the occupational classes is the relationship to other areas of the curriculum in the school. In recent years there has been a definite move to relate the industrial arts courses to other areas such as mathematics and science. There have been two publications from the state department of education sponsored by the state consultant for industrial arts relating to mathematics principles and science principles taught in industrial arts. Both of these publications are a welcome addition to the field, but unfortunately they cannot force the teacher to actually do anything in these areas.

Table 38 indicates the effort that is being made by both the industrial arts teachers and the industrial occupations teachers toward relating their classes with other subjects in the school. From this table, it appears that the industrial occupations teachers are making a slightly greater effort to relate to other subject areas than are industrial arts teachers. However, the difference of four percentage points between the two is probably not great enough to be meaningful.

## Table 38

## EFFORT MADE BY TEACHERS TO RELATE COURSES TO OTHER SUBJECTS

| Type of Class | Yes No. | Yes % | No No. | No % | No Answer No. | No Answer % | Total No. | Total % |
|---|---|---|---|---|---|---|---|---|
| Industrial Arts ............ | 1358 | 76.1 | 385 | 21.6 | 40 | 2.3 | 1783 | 100 |
| Industrial Occupations.. | 294 | 80.3 | 68 | 18.6 | 4 | 1.1 | 366 | 100 |

Probably more significant than the fact that the teachers relate their classes to others in the curriculum are the classes with which an attempt is made to relate. Table 39 indicates the classes with which the industrial arts and industrial occupations programs were related.

The greatest number of both groups stated that they attempted to relate their courses to mathematics and science. Unfortunately there was a substantial number of both groups who did not believe there was need to relate to any other part of the school curriculum. It is obvious by an inspection of Table 39 that both groups of teachers believe there exists the greatest relationship between their classes and same phase of mathematics/science or some combination of these classes.

One aspect of the problem of relating the industrial arts and industrial occupations courses to others in the curriculum would be the ability level of the students.

## Table 39

## SUBJECTS WITH WHICH INDUSTRIAL ARTS/INDUSTRIAL OCCUPATIONS COURSES WERE RELATED

| Subject | Industrial Arts<br>N | <br>% | Industrial Occupations<br>N | <br>% |
|---|---|---|---|---|
| Math/Science | 521 | 29.3 | 91 | 24.9 |
| Math/Science/Language Arts | 280 | 15.7 | 73 | 19.9 |
| Mathematics | 265 | 14.9 | 50 | 13.7 |
| Math/Language Arts | 93 | 5.2 | 29 | 7.9 |
| Science | 109 | 6.1 | 28 | 7.7 |
| Language Arts | 18 | 1.0 | 8 | 2.2 |
| Art | 18 | 1.0 | 3 | 0.8 |
| Math/Social Science | 8 | 0.4 | 2 | 0.5 |
| Social Science | 9 | 0.5 | 0 | 0.0 |
| No Effort Made to Relate | 462 | 25.9 | 82 | 22.4 |
|  | 1783 | 100.0 | 366 | 100.0 |

Table 40 indicates the ability level of the students as reported by the teachers.

Both groups of teachers report the greatest percentage of their students fall in the middle and below ability range. Marshall Schmitt in his nationwide study found that the teachers rated 10 per cent of their students above average in ability in contrast to 1.4 per cent for industrial arts teachers in California and .4 per cent for the industrial occupations teachers in California. There is no reason postulated here for this discrepancy, but there were several teachers who reported that they had all ranges of ability in their class.

## Table 40

## ABILITY RANGE OF STUDENTS

| Range | Industrial Arts<br>N | <br>% | Industrial Occupations<br>N | <br>% |
|---|---|---|---|---|
| Above | 16 | 1.4 | 2 | .8 |
| Middle | 435 | 37.8 | 141 | 38.5 |
| Below | 411 | 35.7 | 134 | 36.6 |
| Above and Middle | 14 | 1.2 | 3 | .8 |
| Middle and Below | 182 | 15.8 | 56 | 15.3 |
| All Ranges | 44 | 3.8 | 12 | 3.3 |
| No Answer | 50 | 4.3 | 18 | 4.7 |
| Total | 1152 | 100.0 | 366 | 100.0 |

The average class enrollment of industrial arts classes and industrial occupations classes is shown in Table 41. It is important to note that class sizes run smaller for the industrial occupations classes than for industrial arts classes. This would be an important aspect of the industrial occupations class, since more individual attention could be given to students in this group.

It is obvious from the data that there is a positive relationship between industrial arts and vocational trade and technical education at all levels. The relationship is much more apparent at the high school level where the industrial arts classes and the industrial occupations classes meet side by side. In most cases, the industrial arts classes and the industrial occupations classes are conducted in the same room with the same equipment by the same teacher. It is obvious that here a direct positive relationship must exist.

## Table 41

## AVERAGE CLASS ENROLLMENT

| Enrollment | Industrial Arts N | Industrial Arts % | Industrial Occupations N | Industrial Occupations % |
|---|---|---|---|---|
| 0-9 | 12 | .6 | 15 | 5.5 |
| 10-14 | 33 | 1.7 | 33 | 12.2 |
| 15-18 | 178 | 9.0 | 59 | 21.8 |
| 19-20 | 291 | 14.8 | 53 | 19.6 |
| 21-24 | 653 | 32.9 | 56 | 20.7 |
| 25-26 | 376 | 18.8 | 25 | 9.2 |
| 27-28 | 247 | 12.3 | 13 | 4.7 |
| 29-30 | 149 | 7.5 | 11 | 4.1 |
| 31-35 | 48 | 2.4 | 6 | 2.2 |
| No Answer | 180 | | 1896 | |

As an indication of this direct relationship, questions were asked of both the industrial arts teachers and the industrial occupations teachers concerning the instructional areas they included in their program and the techniques they use to challenge students in their classes.

The instructional areas included in each program are shown in Table 42. The areas of history and development, effect of industry, and processing raw materials seem to be included more in industrial arts courses, whereas career planning, research and development, economics of industry, distribution of goods, service and supply and management and labor seem to be stressed more by the industrial occupations preparation teachers. With the other areas there seems to be no appreciable difference between the two groups.

Table 43 shows the techniques used by the two groups of teachers. The table shows that more industrial arts teachers use individual textbooks, give more teacher demonstrations and have students create and design their own projects. The industrial occupations teachers emphasized more research and experimentation, more student reports on technical development, more student reports on industry, more field trips, more group projects, and more consumer knowledge. In the other areas both groups of teachers were, by and large, employing the same techniques.

## Table 42

## INSTRUCTIONAL AREAS INCLUDED IN PROGRAM

| | Industrial Arts High School | | | | | | | | Industrial Occupations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Much | | Some | | None | | No Ans. | | Much | | Some | | None | | No Ans. | |
| Instructional Areas | N | % | N | % | N | % | N | % | N | % | N | % | N | % | N | % |
| Optimum Product Utilization | 153 | 10.3 | 654 | 44.1 | 264 | 17.8 | 411 | 27.8 | 86 | 25.5 | 116 | 34.5 | 29 | 8.6 | 105 | 31.2 |
| History of Development | 83 | 5.5 | 997 | 67.3 | 177 | 11.9 | 225 | 15.3 | 35 | 10.4 | 189 | 56.2 | 42 | 12.5 | 68 | 20.2 |
| Effect of Industry | 330 | 22.3 | 890 | 60.1 | 61 | 4.1 | 201 | 13.5 | 116 | 34.5 | 140 | 41.6 | 16 | 4.8 | 63 | 18.8 |
| Processing Raw Materials | 220 | 14.8 | 855 | 57.7 | 175 | 11.8 | 232 | 15.7 | 70 | 20.8 | 148 | 44.0 | 46 | 13.7 | 71 | 21.1 |
| Concepts of Mass Production | 201 | 13.6 | 930 | 62.8 | 142 | 9.6 | 209 | 14.0 | 106 | 31.5 | 142 | 42.2 | 24 | 7.1 | 63 | 18.8 |
| Problem Solving | 691 | 46.9 | 621 | 41.9 | 26 | 1.8 | 134 | 9.4 | 197 | 58.6 | 88 | 26.2 | 6 | 1.7 | 44 | 13.1 |
| Career Planning | 241 | 16.3 | 943 | 63.6 | 108 | 7.3 | 190 | 12.9 | 193 | 57.4 | 92 | 27.3 | 4 | 1.2 | 46 | 13.7 |
| Research and Development | 102 | 6.9 | 696 | 47.0 | 397 | 26.8 | 287 | 19.3 | 60 | 17.9 | 149 | 44.3 | 54 | 16.0 | 72 | 21.4 |
| Economics of Industry | 76 | 5.1 | 741 | 50.0 | 383 | 25.8 | 282 | 19.1 | 63 | 18.7 | 159 | 47.3 | 46 | 13.7 | 67 | 19.9 |
| Distribution of Goods | 32 | 2.2 | 541 | 36.5 | 586 | 39.5 | 323 | 21.8 | 29 | 8.6 | 148 | 44.0 | 83 | 24.7 | 75 | 22.3 |
| Service and Supply | 121 | 8.2 | 675 | 45.5 | 389 | 26.2 | 297 | 20.1 | 87 | 25.9 | 135 | 40.2 | 41 | 12.2 | 72 | 21.4 |
| Management and Labor | 73 | 4.9 | 634 | 42.8 | 493 | 33.3 | 282 | 19.0 | 89 | 26.5 | 152 | 45.2 | 40 | 11.9 | 54 | 16.1 |

# Table 43

## TECHNIQUES USED TO CHALLENGE STUDENTS

| Technique | Industrial Arts |  |  |  |  |  |  |  | Industrial Occupations |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Much |  | Some |  | None |  | No Ans. |  | Much |  | Some |  | None |  | No Ans. |  |
|  | N | % | N | % | N | % | N | % | N | % | N | % | N | % | N | % |
| 1. Use individual textbooks | 845 | 39.0 | 1111 | 51.3 | 142 | 6.6 | 50 | 2.3 | 131 | 39.8 | 135 | 41.0 | 40 | 12.2 | 27 | 8.2 |
| 2. Provide additional help outside of class | 327 | 15.1 | 1485 | 68.5 | 247 | 11.4 | 91 | 4.2 | 78 | 23.7 | 187 | 56.8 | 34 | 10.3 | 30 | 9.1 |
| 3. Place emphasis on the development of knowledge skills | 1173 | 54.1 | 861 | 39.7 | 24 | 1.1 | 92 | 4.2 | 234 | 71.1 | 71 | 21.6 | 2 | .6 | 22 | 6.7 |
| 4. Require expert degree of craftsmanship | 897 | 41.4 | 1086 | 50.1 | 92 | 4.2 | 74 | 3.4 | 236 | 71.7 | 69 | 21.0 | 1 | .3 | 23 | 7.0 |
| 5. Place emphasis on attitude and work habits | 1809 | 83.5 | 279 | 12.9 | 7 | .3 | 55 | 2.5 | 288 | 87.5 | 22 | 6.7 | 0 | .0 | 19 | 5.8 |
| 6. Provide facilities and encourage students to test materials | 365 | 16.8 | 975 | 45.0 | 681 | 31.4 | 129 | 6.0 | 94 | 28.6 | 143 | 43.4 | 63 | 19.1 | 29 | 8.8 |
| 7. Require students to follow teacher's directions and teacher-made plans | 842 | 38.9 | 1153 | 53.2 | 105 | 4.8 | 50 | 2.3 | 141 | 42.8 | 150 | 45.5 | 18 | 5.5 | 20 | 6.1 |
| 8. Research and experimentation | 266 | 12.3 | 1250 | 57.7 | 500 | 23.1 | 134 | 6.2 | 84 | 25.5 | 165 | 50.1 | 49 | 14.9 | 31 | 9.4 |
| 9. Have students make reports on technological developments | 95 | 4.4 | 760 | 35.1 | 1164 | 53.7 | 131 | 6.0 | 35 | 10.6 | 148 | 44.9 | 114 | 34.6 | 32 | 9.7 |
| 10. Have students make reports on industry in the community | 35 | 1.6 | 557 | 25.7 | 1416 | 65.3 | 142 | 6.6 | 23 | 7.0 | 133 | 40.0 | 145 | 44.0 | 28 | 8.5 |
| 11. Have students make teaching aids | 101 | 4.7 | 1137 | 52.5 | 799 | 36.9 | 113 | 5.2 | 24 | 7.2 | 172 | 52.2 | 104 | 31.6 | 28 | 8.5 |
| 12. Conduct teacher demonstrations that students use in constructing projects | 1017 | 46.9 | 866 | 40.0 | 159 | 7.3 | 108 | 5.0 | 117 | 35.5 | 137 | 41.6 | 44 | 13.4 | 31 | 9.4 |
| 13. Stress development of desirable personal-social traits | 1097 | 50.6 | 880 | 40.6 | 92 | 4.2 | 81 | 3.7 | 205 | 62.3 | 96 | 29.2 | 4 | 1.2 | 24 | 7.3 |
| 14. Provide students with field trips to industry | 83 | 3.8 | 738 | 34.1 | 1222 | 56.4 | 107 | 4.9 | 53 | 16.1 | 172 | 52.2 | 83 | 25.2 | 21 | 6.3 |
| 15. Encourage students to evaluate their own progress | 903 | 41.7 | 1101 | 50.8 | 82 | 3.8 | 63 | 2.9 | 193 | 58.6 | 103 | 31.3 | 10 | 3.0 | 23 | 7.0 |
| 16. Give students opportunity in managing shop, supplies, records, safety, etc. | 782 | 36.1 | 1051 | 48.5 | 238 | 11.0 | 78 | 3.6 | 150 | 45.5 | 131 | 39.8 | 27 | 8.2 | 21 | 6.4 |
| 17. Give students experience in group evaluation | 190 | 8.8 | 994 | 45.9 | 827 | 38.2 | 139 | 6.4 | 50 | 15.2 | 150 | 45.5 | 94 | 28.6 | 35 | 10.6 |
| 18. Encourage reference reading | 535 | 24.7 | 1321 | 61.0 | 211 | 9.7 | 83 | 3.8 | 160 | 48.6 | 131 | 39.8 | 15 | 4.6 | 23 | 7.0 |
| 19. Encourage selection of simple projects that can be completed in a short period of time | 652 | 30.1 | 1176 | 54.3 | 209 | 9.6 | 111 | 5.2 | 58 | 17.6 | 148 | 44.9 | 90 | 27.3 | 33 | 10.0 |
| 20. Encourage students to create and design their own projects | 1076 | 49.7 | 792 | 36.5 | 187 | 8.6 | 94 | 4.3 | 145 | 44.0 | 94 | 28.6 | 53 | 16.1 | 37 | 11.2 |
| 21. Encourage students to work on group projects | 197 | 9.1 | 1135 | 52.4 | 701 | 32.3 | 117 | 5.4 | 97 | 29.5 | 158 | 48.0 | 44 | 13.4 | 30 | 9.1 |
| 22. Encourage students to develop consumer knowledge through units of selection, care and use of industrial products | 363 | 16.8 | 1317 | 60.8 | 349 | 16.1 | 121 | 5.6 | 123 | 37.3 | 154 | 46.8 | 22 | 6.7 | 30 | 9.1 |
| 23. Allow students freedom in choosing, planning and carrying out activities | 732 | 33.8 | 1230 | 56.8 | 126 | 5.8 | 61 | 2.8 | 138 | 41.9 | 151 | 45.8 | 17 | 5.2 | 23 | 7.0 |
|  |  |  |  |  | 2151 Total |  |  |  |  |  |  |  | 329 Total |  |  |  |

# ARTICULATION

Articulation of any area of education involves the relationship that exists among the various elements of the curriculum that facilitates a continuous and efficient educational program for all students. It not only includes interdependence between subject matter areas but also relationships between secondary school and institutions of higher education.

Since the learning process is a continuum, efforts must be made to improve the articulation among all levels and areas of industrial education. There must be an evolving inter-relationship between all curriculum categories in order to get the useful, occupational, and personal goals of industrial education to the learner.

Because of the complexity of articulation, this study is limited to the manner of inter-relating industrial education course content from one grade level to the next, even though it is recognized that there is a relationship between industrial education courses and other subjects offered at the same grade level.

California has always had the philosophy of free public education, elementary through college. In this continuum of education, the community college plays a very important role.

The community college, which is a locally controlled public, two-year institution of higher education, affords broad comprehensive programs of instruction for persons of post high school age. The four major purposes of the community college can be identified as:

1. Preparation for advanced study.
2. Vocational technical education.
3. General education.
4. Community service.

As stated, one of the objectives of the community college is that of providing preparation for advanced study. This preparation is usually in the form of providing the first two years of college for transfer to a four-year college or university. In the event that the community college provides the first two years of education, provision must be made for the transfer of the student to a four-year institution. Needless to say, this transition should be accomplished as smoothly as possible with a minimum of unit loss on the part of the student.

In an attempt to determine whether the community college programs in industrial arts in California and similar programs were structured so that transfer to a state college was possible, a short six-question questionnaire was constructed and sent to either the coordinator of technical programs or the deans of instruction of several community colleges in the state. Seventy-three colleges from all sections of the state were involved in the study. Returns were received from 59 of the 73 community colleges, making a total of 78 per cent returns. These returns represented schools from all sections of the state. This study was primarily concerned with the problem of articulation between the two-year community colleges, the high schools, and the four-year colleges. If, indeed, there is to be a continuum of education at the different levels in the state, there must be a smooth transition from one level to another.

Thirty-five or 60 per cent of the respondents indicated that the colleges offered non-reimbursable industrial arts transfer courses. Twenty-three indicated that they did not offer industrial arts transfer courses. This would seem to indicate that the community colleges were aware of the area of industrial arts and were making an attempt to provide courses in this area that would transfer to a four-year college. This would provide better articulation and a student could begin his education in industrial arts in the community college.

Concerning the question of whether industrial arts courses in the community college constituted a major that would lead to an A.A. degree in industrial arts, only 22 of the respondents indicated that their particular community college did have courses in industrial arts that would lead to an A.A. degree. This seems to indicate that, taken together with question one, many community colleges do have a certain number of courses which are classified as industrial arts but do not have enough courses that would lead to an A.A. degree in this field.

In the light of the shortage of industrial arts teachers in the State of California, and the small numbers of teachers which have been graduated in the last few years by the teacher education institutions, it would seem worthwhile for the community colleges to contemplate initiating A.A. transfer degree programs in the area of industrial arts. In this way, many potential students could get a start in the community college.

One of the problems of the community college student, if he contemplates going on for a baccalaureate degree, is the transfer of course work from the community college to a four-year institution. In the case of industrial arts, the student must transfer from the community college to one of the state colleges offering industrial arts. To determine to some extent if there was any articulation taking place between the community college and the four-year industrial arts programs in the state college, a question was asked pertaining to the coordination of the community college program with the four-year college program. It was found that 31 of the 52 responding institutions had some sort of coordinated program with a four-year college. This could be anything from the coordination of one course to a completely coordinated transfer program. Even though well over 50 per cent of the responding schools indicated that they did have a coordinated program, obviously more needs to be done in this area. If, indeed, the community college is going to serve as the first two years of a transfer program in industrial arts, it would seem obvious that the program should be coordinated with the four-year institutions. This is necessary to avoid loss of units for transfering students and the resulting confusion between the four-year institution, the community college, and the student.

Many of the community colleges do not have a complete industrial arts program leading to an A.A. degree or have industrial arts courses as such that are transferable to a four-year college. However, an attempt was made to determine if there were courses offered at the community college which would transfer as industrial arts prerequisites at the state colleges. Forty-four respondents indicated that they offered courses that would meet requirements at a four-year institution. This would mean that students could obtain a portion of their industrial arts training at a community college even though they did not specifically state that they offered industrial arts courses at their institution. However, here were eight respondents that indicated they did not offer courses which would meet an industrial arts requirement at a four-year institution.

There were no reasons given why these eight institutions did not have transfer courses in the industrial arts.

From the foregoing four questions and responses, there can be seen that there is a certain amount of articulation and coordination between the community colleges and the four-year state colleges which offer industrial arts. However, by looking at the percentage of responses, it would be obvious that there is a need for a great deal more articulation between these two institutions. As the number of students increases and as the need for industrial education teachers increases, it will become mandatory that better articulation take place between the two-year colleges and the state colleges if the demand for teachers is to be met. It would be our recommendation that some type of committee be composed to work on ways in which better articulation could be accomplished between the two-year colleges and the state colleges. In the interim we would strongly urge that industrial arts educators at the four-year college level and the coordinators of technical programs at the community colleges make every effort to coordinate their efforts so that a smooth transfer by a student from the two-year to the four-year college can be possible.

Another phase of the study deals with the two-hour industrial occupation classes that are presently taught in the high schools. This phase of the study deals with the amount of cooperation or coordination that has taken place between the community colleges and the high schools offering these two-hour occupational classes.

One of the stated objectives of the high school is to prepare a student for advanced technical training in a community college. If the students are transferring from a high school industrial occupations program to a vocational trade-technical in a community college, there must be some type of coordination or articulation between the two programs. Forty-two of the 54 respondents indicated that they did have vocational preparation courses in their service area. It would seem then that there was a large number of community colleges in the state that have students transferring from industrial occupations programs in the high schools in their service area. Therefore, it was deemed advisable to determine whether any of their staff instructors had met or had worked with staff or teachers in the high schools to determine the content, methods and other aspects of these industrial occupations preparation programs. It was found that 41 out of 54 respondents indicated that they had part of their staff work with the local high schools in an attempt to coordinate the programs.

## RELATIONSHIP OF ALL PHASES OF INDUSTRIAL EDUCATION

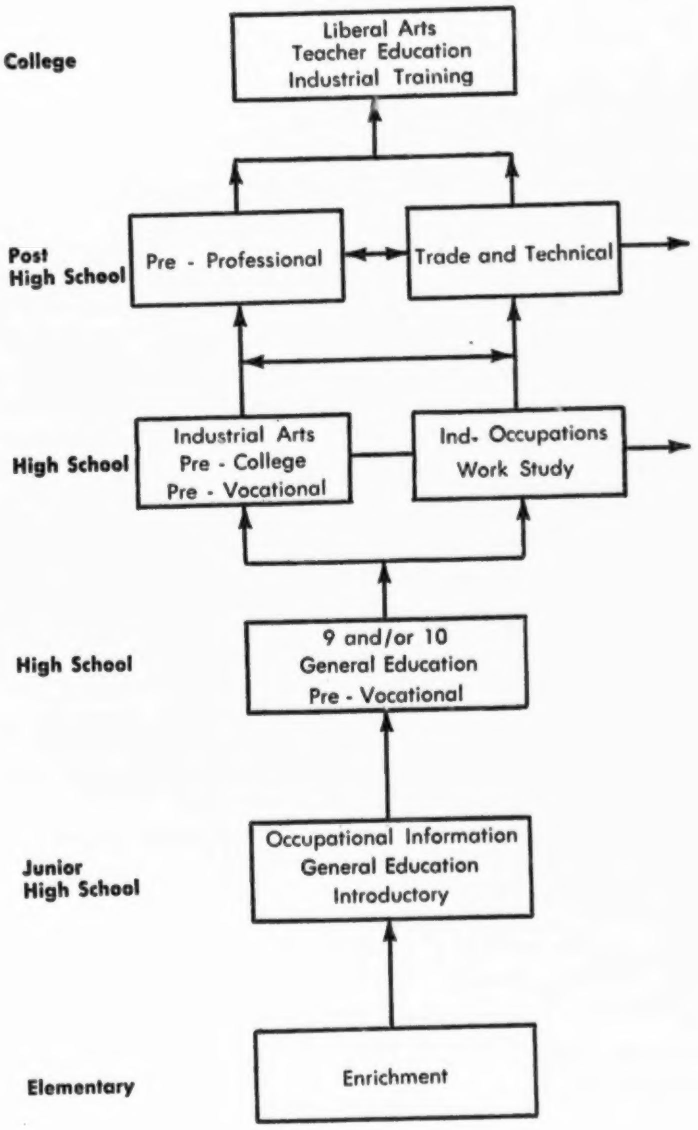
The State of California has for many years used the term industrial education as encompassing industrial arts education and vocational trade and technical education. Industrial education is an integral part of the total program of education that has as its major purposes the preparation of youth and adults for participation in our industrial society and for occupations and professions that include engineers, scientists, traditional trades, service, and technical classifications in industry.

It was the majority opinion of the people interviewed in this study that the term industrial education should be used in defining these programs but that each segment, industrial arts education and vocational trade and technical education, should maintain its own identity within this usage.

The following figure illustrates how these various areas of industrial education are related to provide educational paths for different students.

Industrial education is represented by industrial arts in all areas of education from elementary school through college. The purposes of industrial arts should be:

1. To develop in each student an insight and understanding of industry and its place in our culture.
2. To discover and develop student talents in industrial technical fields and applied science.
3. To develop problem-solving abilities related to materials and processes.
4. To develop in each student proficient and safe use of tools and machines.
5. To develop desirable attitudes and work habits.


College
Liberal Arts
Teacher Education
Industrial Training
Post High School
Pre - Professional
Trade and Technical
High School
Industrial Arts
Pre - College
Pre - Vocational
Ind. Occupations
Work Study
High School
9 and/or 10
General Education
Pre - Vocational
Junior High School
Occupational Information
General Education
Introductory
Elementary
Enrichment

A contemporary instructional program in industrial arts is one which draws its content from the industrial world. All areas of industry are included, such as construction, manufacturing, communication, power and transportation through experience in drafting, electronics, graphic arts, industrial crafts, metals, woods, and power-automotive.

At the elementary level a good industrial arts program should:

1. Acquaint students with the world of industry and technology.
2. Involve construction activities that enrich all subject areas.

At the junior high level a good industrial arts program:

1. Identifies student interests and develops talents in industrial technical fields.
2. Teaches basic skills in the use of tools, machines, and materials.
3. Introduces students to the world of industry and technology.
4. Guides students in vocational intersts including an orientation to senior high school opportunities such pre-professional, pre-technical, and pre-vocational programs.

At the senior high school level the student may elect one of several paths. He may decide to elect one of the programs in vocational-trade and technical education such as industrial occupations or work experience programs or the general education program of industrial arts.

At the senior high school level a good industrial arts program should provide:

1. General industrial arts preparation in limited general shops for the terminal student—those who are not planning to pursue education after graduation from high school.
2. Opportunities for college-bound students to obtain experience in pre-engineering and science including courses in drafting, electronics, metallurgy, metal-working, research and development, etc.
3. Pre-vocational and in-depth introductory programs for students entering vocational trade and technical programs at the post high school. development.
4. General industrial arts courses at the tenth grade level, also as preparation for and wise choice of vocational trade and technical courses or advanced industrial arts at the eleventh and twelfth grades.

The relationship of industrial arts education to vocational trade and technical education is closer at this level than at any other. This is because in most cases the programs are usually taught by the same teachers and in the same facilities. Industrial arts courses are used in most cases as prerequisites and as a means of selection of students for the occupational classes. The teachers are educated to teach in both areas. As reported by Biggam, "The only basic and clearly articulated difference between the two areas of industrial education appears to be one of objective and purpose."[1] Venn states, "The line between the teaching of industrial arts and the teaching of industrial skills is a thin one . . ."[2] Conant, after a study of the curricula of 103 comprehensive high schools in 18 states, comments in essentially the same vein. Writes Conant, "The line between the industrial arts program and the vocational shop program for boys is not an easy one to draw."[3]

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[1] William R. Biggam, "From the Cultivation, A Career." The Journal of Industrial Arts Education. November-December, 1967, p. 41.

During the past six years the growth of the industrial occupations program in the high school has been very rapid in the State of California and every indication is that it will continue.

The objectives of vocational trade and technical education at the high school level are:

1. To enable in-school youth to develop entry-level job skills.
2. To provide youth the opportunity for additional training by transferring to a community college at an advanced level.
3. To enable in-school youth to develop habits and attitudes that contribute to success on the job.

The community college program in vocational trade and technical education has the following objectives:

1. To develop in each student skills, knowledge and appreciation for gainful employment in trades, service and technical occupations.
2. To assist employed workers to achieve satisfaction and success in present jobs or to advanced jobs requiring a higher level of skill and knowledge.
3. To provide for retraining.

The community college also provides the lower division programs in industrial arts for students planning to transfer to the state colleges for addititonal education as industrial arts teachers.

The state colleges provide two main types of programs, the industrial arts education program and the business and industrial technology programs.

The industrial arts program has for its purposes:

1. To provide students preparation to become industrial arts teachers.
2. To teach about industry and its place in American culture.
3. To provide service courses that supplement other majors.

The business and industrial technology programs of the state colleges prepare students for professional level technical occupations in industry and business.

Students should be counseled early to understand that industrial occupations have become so complex that advanced instruction is becoming essential. Many students will enter the world of work before or upon graduation from high school. They may also elect to continue their education in a community college or transfer to an engineering or technology or science program in a college or university. An able high school student pursuing the general education or college preparatory curriculum may enter any of the educational programs available in either the community college or senior college or may enter one of the trades as an apprentice.

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[2] Grant Venn, "Man, Education and Work" (Washington, D. C.: American Council on Education, 1964), p. 27.

[3] James E. Conant, "The American High School Today" (New York: McGraw-Hill Book Co., Inc., 1959), p. 54.

## UNIQUE CHARACTERISTICS WHICH DESCRIBE TRADE AND INDUSTRIAL/TECHNICAL EDUCATION AND INDUSTRIAL ARTS[4]

This statement was prepared by a joint committee of Industrial Arts and Trade and Industrial/Technical Representatives appointed by the Board of Directors of the American Vocational Association. It is the result of many hours of joint discussion. As presented here, it has been approved by the joint committees and by the Board of Directors of the American Vocational Association.

The committee agreed that:

1. **Industrial Education** is a generic term which broadly defines that part of the total educational program which includes instruction in industrial arts education and trade and industrial/technical education.
2. **Trade and Industrial/Technical Education** is a program of vocational education and training for gainful employment in trades, service, and industrial/technical occupations.
3. **Industrial Arts** is a program of education relating to the broad study of selected industries.

### A. CURRICULUM

| **Industrial Arts Education** | **Trade and Industrial/Technical Education** |
|---|---|
| 1. Content is derived from a broad study of selected industries, including the use of tools, materials, and processes. | 1. The content is determined by an analysis of the various job titles in an occupational field for which training is being given, such as the machine industries occupations. |
| 2. It provides for the development of conceptionalized skills and understandings. | 2. The curriculum is developed, reviewed, and updated with the assistance of management and labor representatives from industry. |
| 3. It provides opportunity to apply basic principles of the man-made world as a designer, planner, and user. | 3. The content is continuously changing and is updated to reflect technological changes in each occupational field. |
| 4. Programs are kept current with technological advances and changes in educational media. | 4. Instructional materials include recent industrial publications and modern industrial devices and techniques as an integral part of the instructional program. |
| 5. Curriculum includes instructional programs which are:<br>a. Designed to acquaint student with the general functions and procedures of industry, including guidance for the broad spectrum of industrial occupations.<br>b. Designed to provide a study of the interrelationships of industrial activities leading to the production and manufacturing of industrial products. | 5. The curriculum provides in-depth learning experiences and techniques which duplicate those found in industrial/technical employment. |
|  | 6. The time schedule and the level and amount of instruction must be adequate to develop necessary skills and related technical understanding essential for successful entry into and progress in a trade, service, or an industrial or technical occupation. |

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[4] Von H. Robertson, Editor, "Guidelines for the Seventies" (Chicago: American Technical Society, 1967), p. 109.

| Industrial Arts Education | Trade and Industrial/Technical Education |
|---|---|
| c. Designed to provide an opportunity for a student to concentrate in a broad field such as electricity, electronics, drafting, graphic arts, automotive and power, and materials and processes.<br>d. Designed to foster creative abilities and interests in the use of the tools and materials of industry. | 7. Pre-employment programs are provided immediately preceding employment in order to be most effective.<br>8. Programs are designed to meet the full spectrum of needs from the single purpose operatives to the highly skilled trade and industrial/technical craftsman.<br>9. Pre-employment education and training is usually provided from grades 9 through 14.<br>10. Programs provide open-ended curriculum to permit vertical articulation from secondary to post-secondary levels.<br>11. Programs are provided around-the-clock and throughout the year. Such programs include pre-apprentice and apprentice training, retraining, occupational extension, foremanship, and sueprvisory and management development training. |

## B. TYPES OF SCHOOLS

| | |
|---|---|
| 1. Industrial arts programs are offered in elementary schools, junior high and senior high schools, post-secondary schools, colleges and universities. | 1. Instructional programs in trade and industrial/technical education are offered at secondary and post-secondary levels. These are provided in a broad range of institutions, including industrial plants, departments in comprehensive high schools, vocational schools, departments in junior and community colleges, and in programs of less than baccalaureate level in some four-year institutions. |

## C. TEACHERS

| | |
|---|---|
| 1. A baccalaureate degree program with an approved major in industrial arts education is required for initial entry into the profession. The curriculum is taught and approved completely by industrial arts teacher educators. | 1. The prerequisite occupational proficiency is developed under actual wage-earning situation in a trade, service, industrial or technical occupation. |
| 2. The candidate must have completed a program of professional preparation, including a supervised internship or student teaching experience. | 2. High school graduation or the equivalent is required as the minimal education for acceptance into trade and industrial/technical teacher education. |
| 3. Work experience is desirable as a basis for a broad understanding of industry and the world of work. | 3. Potential teachers recruited from industry must possess personal, physical, and moral qualities essential for the development of a successful teacher. |
| | 4. Quality vocational industrial/technical teacher education programs are required. Such programs are planned, directed and supervised by qualified vocational industrial teacher educators. |

### D. INSTRUCTIONAL FACILITIES

| Industrial Arts Education | Trade and Industrial/Technical Education |
|---|---|
| 1. These must meet standards set by regional accreditation associations and individual state requirements. | 1. The plans for instructional shops, laboratories, and related instructional classroom facilities are based upon occupational analyses and recommendations of vocational industrial advisory committees. The nature of the instructional plant and the variety of equipment are comparable, where practical, to those found in industry. |
| 2. They must include the tools, equipment, materials, and space necessary to implement the proposed curriculum. | 2. Instructional supplies and materials are comparable to those found in industry and are available in sufficient quantity to develop adequate marketable skills. |

### E. STUDENTS

| Industrial Arts Education | Trade and Industrial/Technical Education |
|---|---|
| 1. All students K through 12, post-secondary, college and adults, regardless of their occupational goals, could benefit from experiences offered in industrial arts. | 1. Programs are provided for youths and adults whose goal is entry into, retraining for, or upgrading in trade and industrial/technical occupations. |
| 2. Programs are planned for a large variety of student objectives such as:<br>a. Pre-collegiate programs providing industrial information preparatory to professional study.<br>b. General education programs providing a broad understanding and consumer experience in industrial subjects.<br>c. Elementary programs providing occupational and industrial guidance and introductory experiences in industrial arts.<br>d. Special programs for students having mental and physical handicaps, but still capable of profiting from special courses planned for their abilities. | 2. Students are selected in terms of potential employability. |
| | 3. The minimum entry age into the program is determined by the employability age at the completion of the education and training program. |
| | 4. Students may receive:<br>a. High school diploma endorsed in in an occupational field upon completion of secondary programs.<br>b. A certificate or associate degree with occupational endorsement for post-secondary programs.<br>c. And a certificate of occupational competency for ungraded programs. |
| | 5. Persons with special occupational needs are served in vocational pro- |

### F. GUIDANCE AND COUNSELING

| Industrial Arts Education | Trade and Industrial/Technical Education |
|---|---|
| 1. Industrial arts educators provide the student with basic experiences which help him make his occupational, educational, or professional choice. | 1. Organized programs of vocational guidance provide for recruiting, testing, and selecting students. |
| | 2. Vocational counseling services are provided for in-school and out-of-school youth and adults as an integral part of preparatory, retraining or upgrading programs in trade and industrial/technical education. |
| | 3. Job placement and trainee followup are an integral part of the program. |

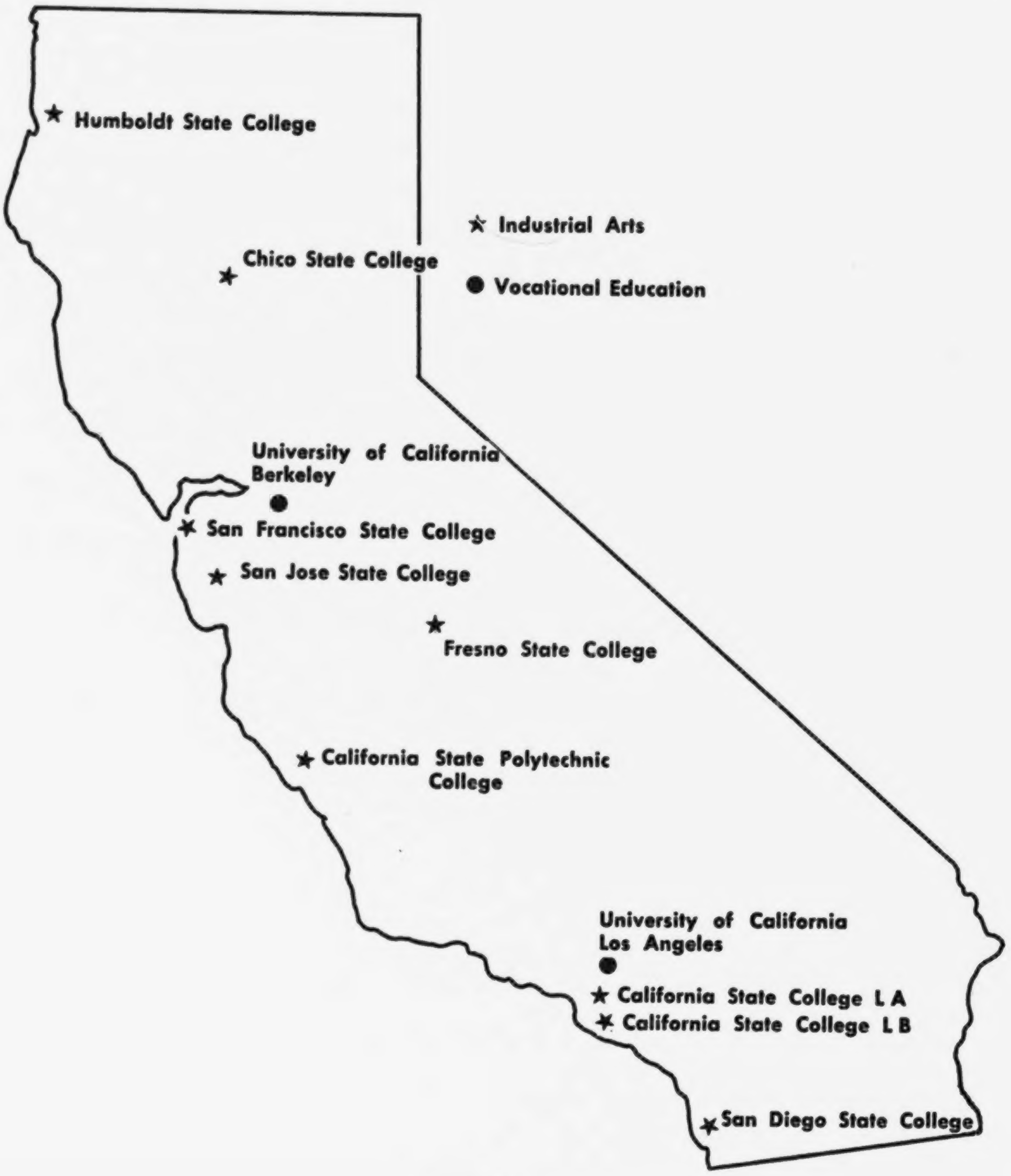
★ Humboldt State College
★ Industrial Arts
★ Chico State College
● Vocational Education
University of California Berkeley
★ San Francisco State College
★ San Jose State College
★ Fresno State College
★ California State Polytechnic College
University of California Los Angeles
★ California State College L A
★ California State College L B
★ San Diego State College

Figure 15
CALIFORNIA INSTITUTIONS OF HIGHER EDUCATION
FOR TEACHER PREPARATION

## CHAPTER V

# Industrial Education in California Institutions of Higher Education

For purposes of this chapter, the term "industrial education" will be used to describe the educational programs of the various state colleges of California. These include industrial arts education, industrial technology, bachelor of vocatonal education, and work leading to the Standard Designated Subjects Teaching Credential—Industrial Arts and Occupational Subjects (the 8.1 credential).

### INDUSTRIAL ARTS EDUCATION

In the California state colleges, industrial arts education is a study of industry primarily designed to prepare elementary, secondary, and community college teachers who will help students (1) gain an insight and understanding of industry and its place in the American culture and (2) discover aptitudes and develop knowledge and skills useful for occupations, professions, and other activities. In the elementary school, the study of industrial arts is integrated with other subject matter. In grades 7 through 14, separated industrial arts curriculums are offered. College industrial arts programs, although principally concerned with preparing teachers, provide a portion of the general education curriculum on some campuses and/or offer service courses for other majors.

Industrial arts education includes a wide spectrum of viewpoints and activities and spans all educational levels from kindergarten through graduate school. Programs in industrial arts education in the state colleges are primarily designed to prepare teachers of industrial arts for the public schools of the state. The teaching of technical facts and manipulative skills and other laboratory activities are aspects of industrial arts which, while concerned with subject matter peculiar to industrial education, also make use of knowledge and concepts from the natural and physical sciences, mathematics, the social sciences, the fine arts, and other disciplines; thus providing the prospective teacher with sufficient skills to give sound demonstrations and instruction to the classes he teaches.

The nature and scope of industrial arts education programs are largely governed by requirements for the appropriate teaching credentials. In addition, the state colleges are challenged and guided by the viewpoints of administrators and industrial arts supervisors as to what constitutes appropriate teacher preparation, by the range of industrial arts subject matter taught in the public schools, and by what industrial arts leaders feel should be taught on the basis of changes taking place in industry and technology.

The nature and scope of a typical college industrial arts education program includes the following:

(1) Technical courses in industrial arts. Skills and technical competence are of great importance; just as music teachers are expected to be competent musicians, so industrial arts teachers are expected to be skilled artisans.

(2) Related sciences. Since industrial arts education draws its content from the science and technology of industry, the study of science and mathematics is an essential part of its curriculum.

(3) Liberal arts. Industrial arts education is firmly committed to the liberal arts; course work in the liberal arts is an integral part of preparation of every industrial arts teacher.

(4) Professional education. Foundation courses in the sociological or historical or philosophical, plus psychological and the curricular and instructional aspects of education form the basis for the professional preparation of all industrial arts teachers. In addition, students receive instruction in career guidance, testing, and other professional education courses.

College industrial arts education programs not only emphasize the acquisition of adequate skills, but also the broad knowledge and understanding needed by industrial arts teachers in the elementary and secondary schools and the community colleges. With this preparation, the teacher can help students at each educational level acquire and use this knowledge of industry for career guidance and for understanding industry and its place in our industrial-technological culture.

The success of the industrial arts program in California public schools reflects the quality of industrial arts teacher preparation in the institutions of higher learning in the state. Teacher educators have done commendable work in making this program outstanding.

The success of the teacher preparation program has also resulted from close cooperation in California between the state department of education, the supervisors of industrial arts, and the industrial arts teacher educators.

Ten institutions of higher learning in California have departments for industrial arts teacher preparation which are accredited for credentialing purposes by the California State Department of Education. Nine of these institutions are California state coleges: Cal Poly San Luis Obispo, Chico, Fresno, Humbolt, Long Beach, Los Angeles, San Diego, San Francisco, and San Jose. The tenth institution is Pacific Union College.[1]

## INDUSTRIAL TECHNOLOGY

Industrial technology offerings in California state colleges consist of baccalaureate and graduate programs preparing students for such positions as those in planning, supply, product utilization and evaluation, production supervision, management, marketing, research, and technical sales. These graduates are capable of analyzing problems as well as recommending, implementing and supervising appropriate solutions. They satisfy the emerging need for technical administrators in industry.

California's employers look to the California state colleges to meet their critical need for professional-level graduates in the relatively new broad field of industrial technology. This demand has resulted from the increasing degree of complexity and job specialization within modern industry. Graduates are sought who are capable of assuming leadership responsibilities in the technical aspects of industrial production and marketing. Colleges and universities in ever-increasing numbers across the nation are initiating baccalaureate and graduate degree programs in technological fields to meet this growing demand.

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[1] Position Paper on Industrial Arts and Industrial Technology in California State Colleges. (California Council on Industrial Arts Teacher Education) 1968.

The industrial technology curriculum is based upon cooperative study and research by both education and industry which identifies undergraduate and graduate preparation. This curriculum includes general education and appropriate studies in mathematics and science, industrial materials, industrial processes and controls and quality assurance, with an understanding of industrial management practices. Industrial theory and practice are reinforced by laboratory experiences through which students gain skills and understanding regarding the many processes and problems in converting raw materials into consumer products. The general industrial fields covered in this curriculum include but are not limited to production, communication, transportation and power. Instruction in these fields is supplemented with preparation in communicative skills, behavioral sciences, economics, and business. Flexibility and adaptability to meet student interests and the increasingly sophisticated needs of industry are important aspects of the curriculum. This structure provides a graduate with both a liberal education and professional-level technological capabilities of immediatie value to industrial employers.

Industrial technology in California state colleges presently includes baccalaureate and graduate degree programs entitled business and industry, industrial sales and technology, printing management, and design and industry. Baccalaureate and graduate programs are provided by California state colleges to prepare graduates to assume professional leadership roles in technological fields. Through articulation agreements community college programs, which prepare students as technicians in one specialized occupation in an industry, may be used as a basis for transfer to state college programs. Employers look to the California state college system as the source of graduates to fill their professional positions in industrial technology.[2]

## BACHELOR OF VOCATIONAL EDUCATION DEGREE

The Bachelor of Vocational Education Degree is offered for those vocational teachers recommended by the California State Board of Examiners for Vocational Teachers. The requirements are stated in the Education Code, sections 23953 through 23958.

The purpose of this degree is to promote the professional advancement of the vocational teachers in California. This program is usually administered by the industrial arts departments in those state colleges where the degree is offered.

## THE STANDARD TEACHING CREDENTIAL WITH A SPECIALIZATION IN SECONDARY TEACHING

The Standard Teaching Credential with a Specialization in Secondary Teaching is earned through a five-year program requiring at least 30 units beyond the bachelor's degree. It authorizes one to teach in grades 7 through 12 any course in which the holder has completed a subject matter major or subject matter minor.

The general requirements include a baccalaureate degree or higher from an approved institution, a fifth year of college or university, taken at the upper division or graduate level, completion of 45 semester hours in general education including course work from four of the following areas: humanities, social science, natural sciences, mathematics, fine arts and foreign language. The candidate must complete a teaching major and minor, one of which must be in a subject designated academic. The professional preparation must also include an approved student teaching program and nine semester hours of course work including the sociological, historical or philosophical foundations of education and curriculum and instructional procedures used in teaching in the secondary schools.

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[2] Ibid.

Under certain conditions a student may postpone the completion of some of the requirements until after first employment. Information concerning specific requirements should be directed to the state colleges or the state department of education.

## THE STANDARD DESIGNATED SUBJECTS TEACHING CREDENTIAL

### Article 8.0 Specialization in Vocational Trade and Technical Teaching

The Standard Designated Subjects Teaching Credential with Specialization in Vocational Trade and Technical Teaching authorizes the holder to teach in grades 9 through 14 and in classes for adults the general and specific subject or subjects named in the credential. For this credential trade and technical education includes general and specific courses and programs in trade, technical, industrial, pre-professional, semiprofessional, public service, and agricultural occupations.

The general requirements for this credential include a total of seven years of preparation and qualifying experience in one of the following combinations: an engineering degree or registration as a professional engineer in the State of California and in addition three years of industrial or appropriate occupational experience; a baccalaureate degree and three years occupational experience consonant with the major field of the degree and related to the occupational field to be named in the credential; or an associate degree or 60 semester hours of course work from an approved institution and three years of experience as a journeyman or comparable qualified worker in addition to an apprenticeship or other recognized equivalent occupational preparation in the trade or technical occupation to be named in the credential.

In addition the candidate must successfully complete appropriate written or manipulative exams to determine subject matter competency. Twenty-two semester hours of professional courses approved by the Supervisor of Trade and Technical Teacher Education of the Division of Vocational Education.

This credential may be granted on the condition of partial fulfillment of requirements. For further information on the specific requirements applicants should contact the Supervisor of Trade and Technical Teacher Education of the Division of Vocational Education at the University of California at Los Angeles or Berkeley.

## THE STANDARD DESIGNATED SUBJECTS TEACHING CREDENTIAL

### Industrial Arts and Occupational Subjects
### (Article 8.1)

The State of California has long been recognized as a leader in the field of education—in industrial education as well as in other aspects of education. With the passage of PL 88-210 (Vocational Education Act of 1963) a considerable acceleration of trade and technical programs at the high school level was anticipated. In most cases it became necessary for teachers to teach both the high school industrial occupations classes and the industrial arts classes. The teaching day was usually divided into three one-hour industrial arts classes and one two-hour industrial occupations class. Therefore the standard designated subjects teaching credential—industrial arts and occupational subjects was adopted. This credential allows school districts to employ teachers from two sources, industrial arts teachers, or holders of an Article 8.0 credential.

An applicant for the standard designated subjects teaching credential in industrial arts and occupational subjects (grades 9 through 12) shall file a complete application for the credential through the Division of Vocational Education, University of California, either at Berkeley or Los Angeles, and shall have completed a program including either (a) or (b).

(a) All of the following:

  (1) A bachelor's or higher degree from an approved institution.

  (2) ONE of the following:

    (A) A standard teaching credential with a specialization in second-teaching with a major in industrial arts and a concentration of 15 semester hours in one of the following industrial arts subjects (areas): automotive mechanics, drafting, electronics, graphic arts, metals, photography, woods.

    (B) A general secondary credential with a major in industrial arts and a concentration of 15 semester hours in one of the industrial arts subjects (areas) enumerated in (A).

    (C) A special secondary in industrial arts with a concentration of 15 semester hours in one of the industrial arts subjects (areas) enumersated in (A).

    (D) A special secondary limited credential in industrial arts with a concentration of 15 semester hours in one of the industrial arts subjects (areas) enumerated in (A).

  (3) Two years of appropriate work experience beyond the learning level, directly related to the area of concentration within the industrial arts major.

  (4) Successful completion of appropriate written or manipulative examinations or both given by the Bureau of Industrial Education to determine subject matter comptency in the occupational field related to the subject to be listed on the credential.

  (5) Six semester hours of professional courses in vocational education offered by the Division of Vocational Education, University of California, and approved by the Bureau of Industrial Education, California State Department of Education.

(b) All of the following:

  (1) A bachelor's or higher degree from an approved institution.

(2) One of the following credentials authorizing teaching in one or more of the occupational subjects areas of automotive mechanics, drafting, electronics, graphic arts, metals, photography, or woods as appropriate; a standard designated subjects teaching credential with a specialization in trade and technical teaching valid for full-time service; a special secondary vocational Class A credential in trade and industrial and public service education; or a special secondary vocational Class B credential in trade and industrial and public service education.

(3) Eighteen semester hours of upper division courses in industrial arts education offered by the Industrial Arts Department of California institutions accredited by the Board to prepare industrial arts teachers. This course shall include the following:

  (A) Six semester hours of professional courses in industrial arts.

  (B) Twelve semester hours of lecture-laboratory technical courses either in the industrial arts subject (area) to be listed on the credential and related to the occupational field or in such other course work as may be determined by the Industrial Arts Department of California instituions accredited by the Board to prepare industrial arts teachers.

The credential authorizes the holder to teach the subject or subjects listed on the credential in both industrial arts and occupational classes in grades 9 through 12 including but not limited to courses reimbursed from vocational educational funds.

This credential may be issued on the basis of a partial fulfillment of requirements. Information on the specific requirements should be directed to industrial arts departments of California state colleges or the Supervisor, Trade and Technical Teacher Education, Division of Vocational Education, at the University of California at Los Angeles or Berkeley.

One of the purposes of the college level industrial arts program is the preparation of teachers for the public schools of California. Because there has been an increasing need for industrial arts teachers and a decreasing supply of industrial arts teachers, certain information was gathered about the state college programs.

## STATE COLLEGES

As shown in Figure 11 the supply of teachers from the California colleges has been decreasing and the demand has been increasing since 1964. In 1967 the supply probably reached its lowest point and the projections for 1968 call for a slight increase in the number of new teachers available from the state colleges.

The total enrollments of the various state colleges is shown in Table 4. There has been an increase in the number of industrial arts majors over that reported by Dobson in his report, "Industrial Arts and Industrial Technology Programs in California State Colleges."[3] The column titled "other" includes industrial technology, business and industry, industrial sales and technology, printing management, and design and industry.

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[3] Clifford Dobson, "Industrial Arts and Industrial Technology Programs in California State Colleges (Los Angeles: California State College Trustees, 1962), p. 16.

## Table 44

## TOTAL ENROLLMENTS AND FTE IN CALIFORNIA STATE COLLEGE INDUSTRIAL ARTS DEPARTMENTS

### Fall Semester, 1967

| | Ind. Arts Majors | Ind. Arts Minors | Master Degree Cand. | Other | Total Dept. Enroll. | FTE |
|---|---|---|---|---|---|---|
| Cal Poly(SLO) | 94 | ........ | ........ | 199 | 293 | 106 |
| Chico | 108 | 8 | 32 | 68 | 220 | 132 |
| Fresno | 157 | 20 | 35 | 331 | 543 | 243 |
| Humboldt | 54 | 7 | ........ | 11 | 65 | 42 |
| Long Beach | 315 | 75 | 140 | 582 | 1112 | 480 |
| Los Angeles | 300 | ........ | 102 | 100 | 502 | 180 |
| Pacific Union | 92 | 40 | 11 | ........ | 143 | ........ |
| San Diego | 290 | 45 | 45 | ........ | 262 | 180 |
| San Francisco (no data) | | | | | | |
| San Jose | 295 | 50 | 168 | 162 | 550 | 395 |
| Totals | 1705 | 245 | 490 | 1434 | 3690 | 1758 |

## Table 45

## NUMBER OF STUDENTS ENROLLED IN STUDENT TEACHING

| | 1966-67 | 1967-68 |
|---|---|---|
| Cal Poly (SLO) | 5 | 10 |
| Chico | 26 | 29 |
| Fresno | 20 | 26 |
| Humboldt | 3 | 10 |
| Long Beach | 32 | 52 |
| Los Angeles | 14 | 26 |
| Pacific Union | 7 | 6 |
| San Diego | 29 | 22 |
| San Francisco (no data) | | |
| San Jose | 13 | 14 |
| Total | 149 | 195 |

While one of the primary functions of the faculties of the state college industrial arts departments is the preparation of teachers, they also engage in other activities of benefit to the profession. For example in the last three years there were over 35 workshops and seminars conducted by faculties of eight state college industrial arts departments. These ranged from seminars in safety education to photography workshops, from technical institutes in electronics to internship in industry seminars. Several seminars, workshops and institutes have been offered in new processes, materials, and techniques. The state colleges have shown leadership in some areas, such as fluid power, but could probably do more in the areas of plastics, ceramics and other materials of industry. From other data contained in the study it can be seen that the state colleges should be offering in-service workshops, institutes or seminars in the areas of instructional media and new products and processes of industry. There have been all too few of these offered in the past.

The faculties of the various state college industrial arts departments continue to be active in the production of professional literature. In the past two years well over 50 articles have been published by industrial arts instructors in the state colleges. In addition to the many articles there were over five books and many manuals authored by this same group. Probably in no other place in the country is there as great a concentration of authors in the field of industrial education.

One of the measures of the leadership shown by the state colleges is the quantity and quality of the research conducted in the various departments. Certainly the industrial arts departments of the various state colleges have shown this leadership within the framework of the colleges. There have been over 25 research projects carried on by various faculty members of the state colleges during the past two years. This is in addition to the smaller projects associated with classes and doctoral dissertations.

In addition to the research projects there have been five NDEA institutes conducted in California. These have been for in-service education of industrial arts teachers.

New courses are constantly being added to the curriculum of the state colleges in order to keep abreast of changing technology. Courses in wood technology, materials testing, fluid power, plastics and others have been added in the last three years.

Approximately 43 per cent of the industrial arts faculties at the state colleges hold doctorate degrees. There is no data on how many are currently working toward the doctorate, but it is safe to assume that the number is substantial. From data collected it was determined that the majority have work experience, and some hold vocational credentials. Most of the state college industrial arts teachers who hold the doctorate have a major, a minor or considerable course work in industrial-vocational education. Many of these same teachers would be qualified by nature of their background to teach course work leading to the 8.1 credential.

In general, the state colleges are doing an adequate job of offering work in industrial arts and technology. There are, however, several areas that could probably be improved. The state board of education sets the pattern for credentials for all colleges. However, each individual college may specify its degree pattern. Consequently there is a certain amount of uniformity in the requirements for credentials, but very little in the requirements for degrees. There never will be complete uniformity in requirements for degrees, but a certain amount of uniformity between programs might be desirable. Toward this end the California Council on Teacher Education has been working toward a common core of industrial arts courses.

## DIVISION OF VOCATIONAL EDUCATION

The faculty members concerned with trade and technical teacher preparation in the Division of Vocational Education at the University of California at Los Angeles and at Berkeley are provided through a contractual arrangement with the Bureau of Industrial Education. The majority of these individuals hold advanced degrees and have backgrounds in both industrial arts and trade and technical education.

Over the years they have conducted considerable research with special emphasis on trade and technical teacher preparation and on methods and techniques of teacher education. Their programs in trade and technical teacher education have received national recognition.

The Supervisors, Trade and Technical Education, have the responsibility for recommending certification for vocational trade and technical teachers, 8.0 and 8.1 credentials. They also have the responsibility for providing the teacher training courses in trade and technical education for people qualifying for these credentials.

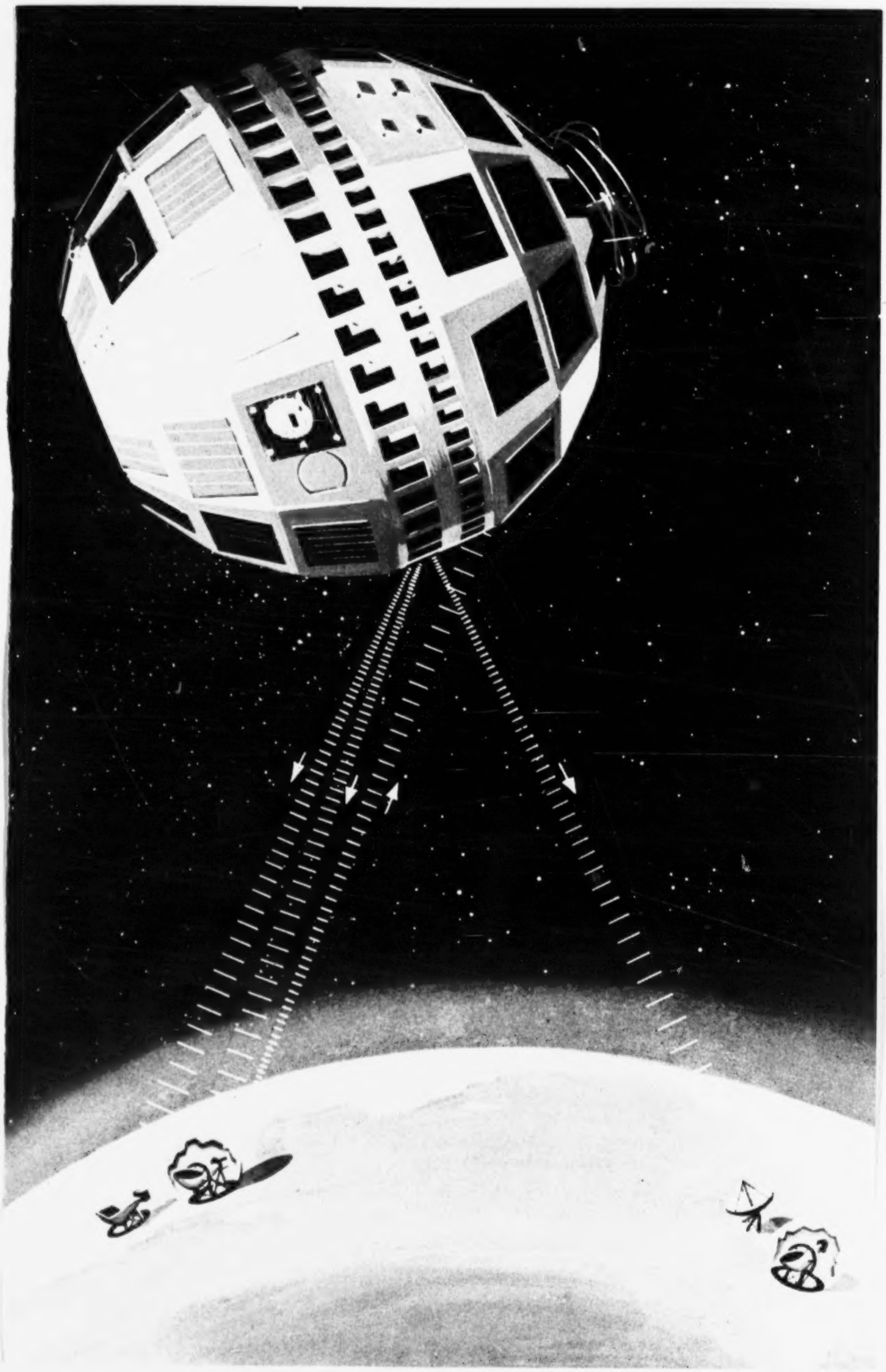
It is recommended that closer cooperation should exist between the Bureau of Industrial Education, the Division of Vocational Education and the Departments of Industrial Arts at the various state colleges. The state colleges have the responsibility for providing the program for the bachelor of vocational education degree for teachers in vocational trade and technical education.

It is recommended that a complete study be made of the 8.1 credential. The credential does not allow industrial arts teachers without two years of work experience to qualify. Provision should be made for industrial internship for these individuals and also for industrial arts majors in the state colleges.

It has been found that for industrial arts majors considerable overlap exists in the six units of course work required for the 8.1 credential. The majority of the state colleges in their professional courses teach the concepts of industrial education. In addition over 80 per cent of the respondents to the questionnaire indicated they wanted college credit for additional courses. Many school districts and some state colleges do not grant credit for extension or correspondence work. It seems feasible that the six units of work could be given either through the state colleges or the division of vocational education.

Regardless of any revisions in the credential structure the faculty members of the state colleges and the division of vocational education should work closer together to provide the best possible teachers and program.

An encouraging note is the addition of a consultant for in-service education in the Bureau of Industrial Education. Several excellent workshops and seminars are being planned through the Bureau of Industrial Education in cooperation with the Division of Vocation Education and selected community colleges. This person should also work with local school districts and state colleges to provide addititonal in-service programs.



## CHAPTER VI

# Summary, Conclusions and Recommendations

### SUMMARY

This is a summary of a study of the relationship of industrial arts education to vocational trade and technical education in California. Data for this study were obtained from many sources. These included a questionnaire sent to all junior and senior high school principals, and a questionnaire sent to each junior and senior high school industrial arts teacher in the state. Interviews were held with city and county supervisors of industrial education to California. Interviews and meetings were also held with out-of-state consultants in several states, including Arizona, Utah, Washington, Wisconsin, as well as many programs in California.

From an analysis of the data it can be seen that California has a strong, well-organized industrial education program, including both industrial arts education and vocational trade and technical education.

The California offering in industrial arts is predominantly the traditional program which includes the areas of automotives, drafting, electricity/electronics, graphic arts, industrial crafts, metals and woods. In some districts schools have added courses such as transportation, power mechanics, plastics technology and photography. However, these latter programs are definitely in the minority. It was encouraging to find many teachers and districts experimenting with new programs, techniques and methods.

California has a strong vocational trade and technical program which until recent years was taught predominantly in the community colleges. During the past few years there has been considerable growth in occupational education at the senior high school level. It was this phase of vocational education with which this study was primarily concerned. Included in this program were the areas of automotives, electronics, drafting, graphic arts, metals, woods, and building construction.

Industrial education is an integral part of the total program of education that has as its major purposes the preparation of youth and adults for participation in our industrial society and for occupations and professions that include the traditional trades, service, and technical classifications in industry. It is well thought of by school administrators, as indicated by the responses received from the school principals.

Industrial education is represented by industrial arts in all areas of education from elementary school through college. The purposes of industrial arts should be:

1. To develop in each student an insight and understanding of industry and its place in our culture.
2. To discover and develop student talents in industrial technical fields and applied sciences.
3. To develop problem-solving abilities related to materials and processes.

4. To develop in each student a measure of skill in the safe use of tools and machines.
5. To develop desirable attitudes and work habits.

At the elementary level a good industrial arts program should:

1. Acquaint students with the world of industry and technology.
2. Involve construction activities that enrich all subject matter areas.

There are some excellent industrial arts construction programs offered in the elementary schools in the State of California, but in many instances the construction activities have all but disappeared from the elementary school curriculum. There are probably many factors which account for this change. The ones listed most frequently by supervisors and teacher educators were the mandated programs that have come into being in recent years and the change in the credential law in 1962. The courses for elementary school teachers offered by the industrial arts departments at the state colleges have likewise all but disappeared.

This appears to be opposite to the national trend. During the past few years the American Industrial Arts Association has strongly supported a strengthened program at the elementary level.

At the junior high school level a good industrial arts program should:

1. Identify student interests and develop talents in industrial technical fields.
2. Teach basic skills in the use of tools, machines, and materials.
3. Introduce students to the world of industry and technology.
4. Guide students in vocational interests including an orientation to senior high school opportunities such as pre-professional, pre-technical, and pre-vocational programs.

In most instances the programs in the junior high school are excellent. The most common type of program is the rotation of students through a required sequence of two to six different instructional areas in the seventh and eighth grades and then offered as an elective in the ninth grade. The areas most frequently found in the junior high school are drawing, electricity, metal, and wood.

At the senior high school level the student may elect one of several options. He may decide to elect a program of vocational-trade and technical education such as industrial occupations or work experience, or the general education program of industrial arts.

At the senior high school level a good industrial arts program should provide:

1. General industrial arts preparation in limited general shops for the terminal student—those who are not planning to pursue education after graduation from high school.
2. Opportunities for college-bound students to obtain experience in pre-engineering and science including courses in drafting, electronics, metallurgy metal-working, research and development, or any other area of interest.

3. Pre-vocational and in-depth introductory programs for students entering vocational trade and technical programs at the post high school level.
4. General industrial arts courses at the tenth grade level as preparation for and wise choice of an industrial occupational program or an advanced industrial arts program in the 11th and 12th grades.

The objectives of vocational trade and technical education (industrial occupations) at the high school level are:

1. To enable in-school youth to develop entry-level job skills.
2. To provide youth the opportunity for additional training by transferring to a community college at an advanced level.
3. To enable in-school youth to develop habits and attitudes which contribute to success on the job.

The number of industrial occupations programs in the high school has increased rapidly since 1963. It is anticipated that this trend will continue. These classes are, in many instances, being taught in the same facility on the same equipment by the same teacher as the advanced industrial arts classes.

Teachers of industrial arts and industrial occupations subjects use many of the same methods and instructional materials since both derive their subject matter content from industry.

Industrial arts courses are designed to provide a general orientation to industry rather than to develop a high level of competence in specific skills. As such industrial arts may serve as general education for some students and as prevocational education for others. Therefore, there is a close relationship between industrial arts and vocational trade and technical education and close articulation should exist at all levels.

Upon a review of the pertinent literature several things become apparent. First, there are many studies being conducted throughout the country which relate to some phase of industrial education. Most of these studies are concerned with some facet of curriculum development.

Probably the largest and most comprehensive are the American Industry Project at Stout and the Industrial Arts Curriculum Project at Ohio State. Both of these have progressed beyond the theoretical stage and are currently being implemented in selected schools throughout the country.

No attempt was made to study the community college programs other than the problems of articulation. Articulation between the community colleges and the high schools and between the community colleges and the four-year colleges is presently less than adequate. Many teachers and administrators indicated that there was some articulation taking place, but they also indicated that more could be done if a real effort were made.

At the four-year college level there are presently ten California colleges offering teacher preparation programs in industrial arts. The success of the graduates of these institutions indicates that they are doing a good job. Unfortunately the supply of teachers from these colleges has not been able to keep pace with the demands made by the public schools. During the 1966-67 school year the supply of teachers probably reached its lowest point. Beginning with the 1967-68 school year it appears that the number of graduates available for teaching will increase and will probably continue to do so for the next few years.

Even though there is an increase in the number of college graduates available for teaching positions the supply will not meet the demand. Industrial arts will remain as a critical shortage area with a constant need for a greater supply of teachers.

The consultants indicated that to keep the industrial education program moving ahead in future years there must be an increase in supervision at all levels, more in-service education programs, and a greater emphasis on experimental and pilot programs at all levels.

## CONCLUSIONS

**There is a relationship between industrial arts education and vocational trade and technical education at all levels.** This relationship is closer at the high school level between industrial arts and the industrial occupations classes.

**The three-year high school is predominantly a large-city type of organization associated with large unified districts.**

**The junior high schools have either a rotating type program or a comprehensive shop type program.**

In those schools of sufficient enrollment to have more than one industrial arts facility, the rotating type program is most prevalent and should be continued. In those schools where enrollment is of a limited size the comprehensive type program would offer the most industrial arts experiences to the greatest number of students.

**In the junior high schools because of required courses all ability ranges are represented in industrial arts classes.** In the senior high schools ability range of students in industrial arts and industrial occupations falls in the middle-and-below ability range.

The majority of the administrators reported that all students could profit from a good industrial education program and therefore classes should be available for all students.

**A new school pattern that is emerging that needs considerable study is the middle school concept.** This school pattern is K-4, 5-8 and 9-12. This pattern is receiving nationwide attention and there are indications that some school districts in California are moving in this direction.

**The industrial arts instructional program is too narrow in scope, with a concentration of instruction in the traditional areas of drafting, wood and metal.**

To improve the overall program, more instructional content should be included in areas such as graphic arts, electricity/electronics, power mechanics/transportation, industrial plastics and materials, and photography.

**Power mechanics is an instructional area that needs more definition.**

It was found that in some schools power mechanics was the basic, beginning automotive course; whereas, in other schools power mechanics was the most advanced course in the automotive sequence.

**Automotives and/or power mechanics should be included in the school program for all students.**

In an area where so many people depend on the automobile and the airplane for transportation, some basic knowledge of these modes of transportation should be available to all students.

**Students majoring in industrial education should give more consideration to a minor in mathematics and science.**

The subject industrial arts teachers are most frequently called upon to teach outside of industrial arts is mathematics.

**There is a definite increase in occupation-trade and technical courses at the high school level as indicated by programs in Washington, Utah, Wisconsin, New Jersey.** This trend will continue and the recommendation in most cases is that these programs should be incorporated into the comprehensive high school.

**Most industrial occupations classes should be preceded by one or more industrial arts classes.** Many teachers indicated that the industrial arts classes were used for selecting students for industrial occupation classes. Over 71 per cent of the respondents indicated that they had a prerequisite for their industrial occupations classes.

**More emphasis must be given to the placement of graduates of the industrial occupations programs.**

Only slightly over 50 per cent of the industrial occupations teachers indicated that they gave assistance in finding employment.

**There is a need for greater articulation between industrial occupations classes in the high school and the community college trade-technical program.**

Only one-third of the high school instructors and one-half of the community college deans of instruction indicated they were articulating their programs.

**There are substantial numbers of industrial education teachers working for the Pupil Personnel Credential.**

Occupational information and career guidance are going to assume more and more importance in the schools. It is only logical that personnel with the background related to industry should participate in career guidance.

**Both industrial arts teachers and industrial occupations teachers are making a real effort to relate their classes to mathematics and science classes.**

**There will be a change in the industrial education teacher of the future.** He will have a good formal collegiate education, a sound background in general education, industrial experience, and will continue to improve his competency by additional in-service education.

**State colleges should offer special seminars, institutes or workshops in the areas of instructional media and new industrial processes and procedures.**

Over 90 per cent of the respondents indicated an interest in new processes and procedures and 60 per cent indicated an interest in instructional media.

**College degree credit should be granted for in-service education experience.**

Many colleges and universities will not accept extension credit for degree programs. Likewise some school districts will not recognize extension credit for salary purposes. Slightly over 80 per cent of the respondents indicated that they wished to receive college credit for in-service education.

**State colleges should implement a program of supervised industrial visitations for industrial education teachers.**

Over 50 per cent of the teachers indicated an interest in some type of industrial visitation as part of their in-service education program.

**An internship program in industry should be established in state colleges to afford an opportunity for teachers to secure supervised industrial experience.**

Although 83 per cent of the respondents indicated they have some industrial experience, there is a need for some provision for those who do not possess the required experience to obtain the 8.1 credential.

It is also highly desirable for all industrial education teachers to have industrial experience in order to provide the proper understanding and interpretation of industry as well as providing career guidance for the students.

**There will continue to be a shortage of qualified industrial arts teachers for several years.**

The supply of degree teachers for industrial education has been steadily declining since the credential act of 1962. The number of graduates of the California state colleges available for teaching positions hit a low in 1966-67. There was a need for approximately 600 new teachers during the same period. This meant there was a need to look for 500 teachers from other sources either from out-of-state or by using emergency credentials. In 1967-68 the number increased and will continue to increase as long as emphasis is placed on teacher recruitment.

**There is a program of articulation between the community colleges and the four-year state colleges which offer industrial arts.**

However, it is obvious that there is a need for more articulation between these institutions. As the number of students increases and as the need for industrial education teachers increases it will become mandatory that better articulation take place between these two levels of education.

**There are members on state college faculties qualified for teaching the core courses for the Standard Designated Subjects Credential Industrial Arts and Occupational Subjects.**

If these courses were taught by state college faculty members on state college campuses, college credit could be given which would be applicable to degree programs. It would also make the courses available at several centers throughout the state.

## RECOMMENDATIONS

The recommendations in this section of the report have been developed from the data in the questionnaires, visitations to various programs and from the responses of consultants interviewed.

**The term industrial education should be used as a generic term, with each segment of the program, industrial arts education and vocational trade and technical education, maintaining its own identity within this useage.**

There is a close relationship between these segments of the program which has traditionally been comprised of the two major areas—industrial arts and vocational trade and technical education. Both areas together bear the name of industrial education since they relate to the materials, processes, skills and knowledges of industry. Philosophically, however, the two areas differ in principal purpose and, to some extent, in method. Further, they deal with distinctly different groups of students or with the same students at different stages of learning.

**Area conferences should be held throughout the state with both industrial arts teachers and vocational trade and technical education teachers so that an understanding of each other's functions and purposes can be clarified.**

**The State of California has a strong industrial education program which should continue to grow and improve along the lines that have been established.**

### Elementary School

**Instruction about the "world of work" should begin at the elementary school level.** Increased emphasis should be given to strengthening this program by working with school administrators, elementary teachers and supervisors.

**The faculty members of the industrial arts department of the state colleges should work with the elementary education departments at their college to establish industrial arts course work as required courses for elementary teachers.**

**The state guide for elementary education should be rewritten with more emphasis placed on the world in which we live.**

**Careful attention should be given to the industriology program at Wisconsin State University, Platteville, Wisconsin.** This program is being developed to provide prospective elementary teachers and supervisors with knowledge about industry. Experiences will be provided which will enable them to integrate concepts of industry into their daily teaching.

### Junior High School

**It is recommended that junior high school programs continue as established.** This usually includes the rotation of students through two to six different industrial arts instructional areas in the seventh and eighth grades and an elective in the ninth grade.

**Curriculum studies should continue at the junior high school level.**

There are experimental and pilot programs being conducted at the junior high school level in such areas as plastics, industrial research and development (IR and D) and power mechanics. Information about these should be disseminated to all teachers throughout the state.

**The teachers and supervisors of industrial arts at the junior high school level should take a long look at two nationwide studies that are being conducted to provide a greater insight into industry.**

These are the American Industry Study being conducted at Stout State University and the Industrial Arts Curriculum Project at Ohio State University.

### Senior High School

**The industrial arts program at the senior high school level should be conducted in limited general shops and oriented towards a true study of industry.** Science and mathematics should be emphasized throughout the program so that students can see the relationship between basic sciences and the technology of industry. There should be increased research and experimentation programs for the gifted learner and increased manipulative programs for the less gifted.

**More complete laboratory facilities are needed in the senior high school.** Consideration should be given to a study of the state aid building program in relation to labortory size and amount and type of equipment, as this is not realistic in relation to the changing industrial concepts and their relationship to the school curriculum.

**The number of years in one subject area of industrial arts should be limited to two.** A student, if he desires more industrial arts, should transfer to a different area of industrial arts.

**Industrial occupations programs in the high schools should begin with grade 11.** General education is so important for a vocational education foundation and for citizenship that it is highly desirable that major attention be given to general education subjects in the earlier high school years and specific vocational programs be postponed until grade 11.

**Care must be taken in the establishment of high school industrial occupations programs. A good program in industrial arts should be provided for all students and should also be a required base for developing the industrial occupations curriculum.**

**There has been general agreement by teachers, supervisors and consultants that a good industrial occupations program should be preceded by a good industrial arts program.** The industrial arts program should provide occupational information and guidance for the individual. It should also provide the students with a basic minimum content in technical aspects for each area. The industrial occupations program can then be built upon this background. This would allow the occupations program the opportunity to provide greater depth because there would be a basic core of knowledge which the student would already possess.

**Industrial occupations programs should be established when a need exists as shown by labor market indications. These should also be based on**

**the cluster of occupations concept so that the student is better prepared for employment.**

**To gain maximum benefit from both the industrial arts programs and the industrial occupations programs there should be closer articulation.** The consultants all agree that in many cases there is considerable wasted motion and/or missing information because of a lack of articulation between the various levels of industrial arts and vocational trade-technical education.

**Occupational programs should be classified on the basis of meeting the needs of students and not on whether they are federally reimbursed.**
In many high schools where trade and technical classes are not offered, the industrial arts classes provide students with an opportunity to develop skills and knowledge. For these students the program provides a measure of vocational education. These advanced programs even if they are called industrial arts courses should be based on community need, proper selection of students, adequate facilities, placement and follow-up.

**There should be increased emphasis on work experience programs. This is especially true in small communities where coordinators could work with several high schools in the area or out of occupational centers operated by the county.**

## Colleges and Credentials

**It is recommended that the industrial education teacher be one who has a good formal collegiate education in technical knowledge and skill plus a sound background in general education; has industrial experience; and keeps his industrial experience current by taking an active part in in-service education and summer employment.**

**The state colleges should develop advisory committees consisting of supervisors and teachers to assist in establishing the course work for the various levels in industrial education.**

**Industrial arts teacher education departments should continue to evaluate their program.** They should experiment with new approaches in curriculum and introduce changes which will result in the preparation of teachers capable of organizing and conducting secondary school programs more nearly in line with the purpose and objectives of the changing industrial arts programs.

**Every effort should be made to remove the academic versus nonacademic classification from the Standard Teaching Credential for industrial arts teachers and all other teachers in the applied arts area.**

**Close cooperation should be developed between the state colleges and the Bureau of Industrial Education to provide qualified teachers for the high school industrial occupations programs and the community college progams.** The 8.1 credential should be revised to provide the industrial arts teacher with the opportunity to complete the requirements for this credential within the present five-year program. Many administrators are requesting industrial occupations teachers directly from the state colleges.

**It is recommended that the six units of course work required for the in-**

**dustrial arts teachers for the 8.1 credential be offered by selected state colleges in addition to courses presently being offered since there are faculty members at various state colleges who have had course work and experience which qualifies them to teach these courses.**

**A work internship program in industry should be developed to provide all industrial education teachers with a knowledge of industry and to assist in preparing teachers for the high school occupational programs.**

**There should be greater emphasis on course work in career guidance and occupational information at the state college level.** Since there is now an increased emphasis on career guidance and occupational information at all levels of public education it is important that industrial arts teachers have more background in this area.

**Emphasis should be placed on recruitment of industrial education teachers at all levels.**

It appears that, for some time to come, there will continue to be a shortage of fully qualified industrial education teachers. Therefore, it is imperative that teacher recruitment be strongly emphasized at all levels.

### General Recommendations

**The industrial arts program should provide greater emphasis in mass production, machine production, technical and scientific theories and concepts, and student assignments that involve the solution to industrial problems through research, planning, creating and inventing.**

**Although California has an excellent industrial education program, it is recommended that careful attention be given to curriculum studies currently being conducted in California and other parts of the country.**

**Industrial arts teachers of local school districts should be recommending that distict personnel submit proposals for experimental and pilot programs and increased equipment under the NDEA Title III-A Act.**

**The state consultant for industrial arts should concentrate his efforts and time on the leadership and coordinating functions of state supervision. He should rely more heavily on teacher education institutions for technical assistance to local school personnel and program improvement.** There should be additional personnel at the state level for supervision of industrial arts with the possibility of locating a consultant at each regional office.

**The state colleges, the Bureau of Industrial Education and local school districts should work together in establishing and providing programs of in-service education.** The survey indicated a desire for programs in the area of instructional media and in new developments and processes in each of the laboratory areas. The teachers indicated that credit should be granted for these programs. The new staff member appointed by the Bureau of Industrial Education for promoting in-service education should work with all agencies. Funds are available from the Educations Professions Development and the VEA act of 1963 for these programs.

**More emphasis should be placed on having industrial education teachers work for the Pupil Personnel Credential.**

It is encouraging to note that there are substantial numbers of teachers working toward the Pupil Personnel Credential. In the years to come, as more emphasis is placed on technology and occupational orientation, there will be a need for additional qualified people with a background of industrial knowledge qualified for counseling.

## RECOMMENDATIONS FOR FURTHER STUDY

**Because of the decreasing amount of time available for actual classroom supervision by the different supervisors, it is recommended that a study be initiated to determine the amount and kind of supervision needed at each of the levels and for each of the various types of programs.** By identifying the critical needs in the area of supervision, more concentrated effort could be made in these areas and less time would be spent on non-critical functions.

**It is recommended that an evaluation of each curriculum area of the industrial occupations program be undertaken.** This evaluation should be based on the objectives of a sound occupational program.

**It is recommended that a curriculum study be initiated as to the best methods to teach an understanding of industry in the industrial arts programs at all levels, elementary, junior high school and senior high school. This should include new techniques of teaching and new technologies.**

**It is recommended that a study be completed to determine the most profitable way of articulating high school and community college industrial education programs.** Because of the increase in technology it is necessary to have close articulation between all segments of education.

**It is recommended that large-scale curriculum studies be initiated for each of the curriculum areas of the industrial occupations program with the intent of bringing the course to the level of current practice in the area.** From limited curriculum studies it has been found that some of the concepts and methods being taught in the industrial occupations programs are not what is currently being practiced in the occupations.

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